UNITED STATES ARMY

AVIATION DIGEST

MAY 1973

Aeromaintenance

UNITED STATES ARMY AVIATION DIGEST

MAY 1973 VOLUME 19 NUMBER 5

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ABOUT THE COVER

This month the DIGEST is introducing the Aeromaintenance feature which will be symbolized by the eagle appearing on the front cover. All agencies are invited to make contributions to the new feature . . . the first of which appears opposite on p. 1

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Care And Use Of Your 2028

Darrell Godier, DAC

Technical Writer, Maintenance Directorate, Technical Publications Division, USAAVSCOM

A PORTION OF the January 1973 AVIATION DIGEST's "Maintenance Matters" was titled "Manuals In Error." The paragraph stated that certain publications contained errors and that these errors could cause problems in the use of these publications.

The problem was that the article wasn't specific in citing the errors. With specific identification, manual users could have looked at certain areas closely while trying to accomplish the maintenance using these instructions.

The paragraph did bring forth a good point which is the gist of this article.

First, I am a technical writer. I am responsible for preparing technical publications on aviation equipment. When someone approaches me and says, "Your manuals contain errors" or "Your manuals are no good" my first thoughts are: "Errors in my manuals? Never happen, sweetheart!"

There are words I could use to cover the situation but they aren't very technical, plus it would probably delay getting to the point. So I compose myself, get my stuff together mentally, and say, "Where are the errors?" In other words, "Show me!"

As I said, I am *responsible* . . . responsible for giving the user the best operating and maintenance instructions I possibly can. The instructions must be complete and in sufficient detail to enable the user to do his job safely and efficiently.

If you analyze the user's responsibilities, he has one to me. That is to tell me each and every time I don't do my job. How? The DA Form 2028.

The 2028 was designed to provide a direct communication link between the publications preparer and user. It pinpoints the problem —be it error or lack of detail. This is what I need to do *my* job. General statements do little good. Technical writers must have all the details.

To publish a manual or get an error corrected isn't a simple process. If I had to name a process similar to the publications process, it would have to be "mating elephants." The reasons (as far as manuals are concerned, that is) are:

- It's done at higher levels and requires a lot of coordination.
- It's done with an unusually large amount of screaming and noise.
- It usually takes a long time to see the results.

Technical changes must be approved by engineers. Changes to certain parts of the operating instructions must be coordinated with the U.S. Army Aviation School at Ft. Rucker, AL. A lot of people get into the act, but it's necessary.

Changes to manuals are categorized URGENT or NORMAL. The urgent changes primarily deal with safety of flight and, of course, are made immediately. The normal changes may be held until the next change cycle. Since the manuals are on a specific delivery schedule, this will naturally affect the time before the changes you request are seen in print.

All of this boils down to one thing: The publications system is organized to ensure that the user gets the most complete and accurate data possible.

The system is one of review, final review, acceptance and final edit. This process weeds out most errors. Experts from many Army agencies get a chance to comment on the publication at formal reviews conducted at prime contractors' facilities. Once in a while the experts, including the technical writers, forget about the inexperienced mechanic—the new guy fresh from the school who really hasn't used his recently acquired knowledge. The result is that the instructions are vague or hard to understand.

These inexperienced operators and mechanics are the guys who use the manuals the most. They play a major role in pinpointing errors. They have the responsibility to bring errors or questions to the attention of the technical writers.

My summary is brief. Mechanics, for example, are constantly advised to keep their work areas clean, keep their aircraft clean and keep their tools clean.

A publication is a tool. It's as important to the mechanic as any wrench in his toolbox. So why not keep your publications clean? Submit the DA Form 2028. Give me the details I need to do my job.

Helicopter Low Level NIGHT Operations

This article gives Army aviators a look at the future in night capability prompted by recent successes in research and development. The author conducted many of the experiments associated with CAVNAV and tells of the promise of this system for *night* flights under VFR conditions. A related story by Major James, beginning on page 26, gives technical aspects of the system

Lieutenant Colonel George W. Moses

THE OCTOBER 1972 U.S. ARMY AVIATION DIGEST contained an article by Lieutenant Colonel Donald R. Hull entitled "The Way of the Future: Low Level." I agree with LTC Hull, but would go one step further and add the word *night* to his title.

LTC Hull has done an excellent job of outlining the threat posed by Communist block antiaircraft systems. I would only add that the optic systems available on some of these weapons provide an excellent daylight detection and engagement capability, even when aircraft are being flown at altitudes which might hamper radar detection. These systems, plus the known emphasis placed on night operations by Communist block forces, make it imperative that U.S. Army aviation units be capable of performing low level night operations if they are to accomplish their mission with an acceptable level of survivability.

There are many research and development projects directed toward providing night low level operational capabilities; however, these projects are mostly of a long range nature with little impact on operations expected for several more years. The U. S. Army Electronics Command at Ft. Monmouth, NJ, has responsibility for a study titled "Low Level Night Operations" designed to determine exactly what cues and instrumentation a pilot must have to fly low level under varied conditions of light levels and visibility. This study is intended to provide parameters for the development of a true all-weather, day/night low level flight system.

Previous systems such as FLIR (forward looking infrared) and INFANT (Iroquois night fighter and night tracker) were primarily designed for target acquisition and are expensive. complex systems requiring dedicated aircraft for employment. They required extensive training for use as a flight system and have not provided the desired degree of capability for performing low level night flights.

Proper use of electronic countermeasures (ECM) and nap-of-the-earth (NOE) flight should allow helicopters to operate in a mid-intensity warfare environment with acceptable loss rates; however, NOE flight at night without some sort of aid for the pilot does not appear designed to increase life expectancy. The U. S. Army Combat Developments Experimentation Command is conducting experiments to determine how well pilots can operate at night with proper training. Indications are that well-trained pilots can conduct limited low level night operations using radar altimeters and accurate map navigation; however, without a system to increase the pilot's night vision, NOE flight appears limited to full moon nights even for well-trained crews.

There is a system developed by the U. S. Army Land Warfare Laboratory (LWL) which may provide a relatively inexpensive, simple interim solution for night NOE flights under VFR conditions. This system, known as CAVNAVS, is undergoing evalua-

LTC Moses is assigned to the U. S. Army Land Warfare Laboratory at Aberdeen Proving Ground, MD. He is an Infantry officer and has recently been accepted for the R&D career specialty program. He served two tours in the Republic of Vietnam—one with the 14th Aviation Battalion in 1964-65 and the other with the 269th and 212th Aviation Battalions in 1967-68. He is a dual rated senior aviator.

The U. S. Army Land Warfare Laboratory is a Class II R&D activity assigned to the Office of the Chief of Research and Development

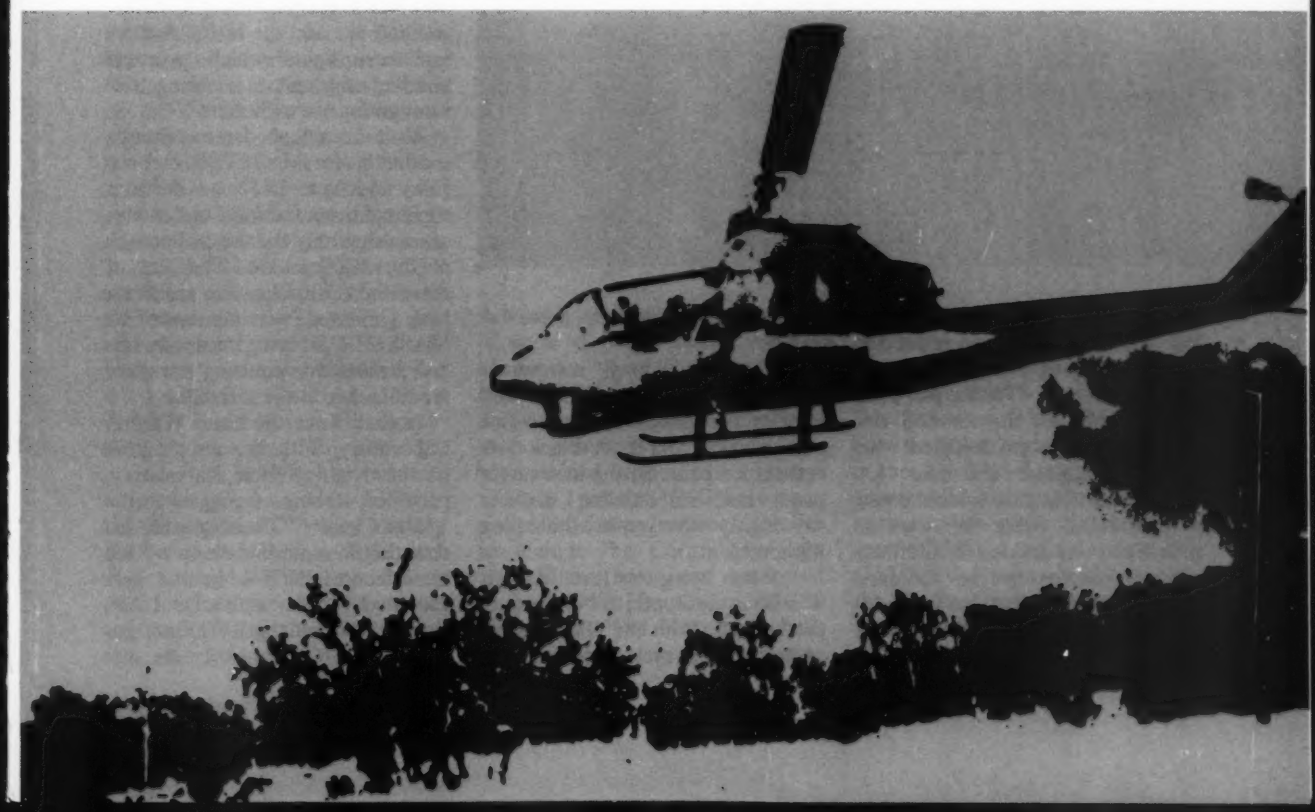
tion by Modern Army Selected Systems Test Evaluation and Review (MASSTER) at Ft. Hood, TX, to determine the operational capabilities and limitations of the system.

CAVNAVS is an acronym for Combat Air Vehicle Navigation and Vision Study. The CAVNAV study was undertaken by LWL in April 1971 based on a requirement from MASSTER. In testing doctrine and tactics for mid-intensity warfare MASSTER had determined low level flight, to include night NOE operations, would be required for helicopters to survive; however, since there was no acceptable system available to provide this capability, realistic testing was difficult if not impossible. LWL conducted a 2-month study to identify the capabilities of available systems and propose a system which would permit night low level operations to include NOE if possible. Based on this study, in June 1971 LWL was assigned the task of developing a "quick-fix" interim system to permit low level night operations under VFR conditions. Three approaches were approved for the feasibility phase of development and testing by LWL:

- Use of visual light searchlights.
- Use of pink light (infrared or ir) searchlights with night vision goggles.
- Use of night vision goggles alone.

The night vision goggles (NVG) selected for testing were the AN/PVS-5 developed by the U. S. Army Night Vision Laboratory. The NVG had been developed for use by ground units and several minor modifications were required for airborne testing. The principle modification consisted of remounting the goggles in a face mask which had been developed by the Military Airlift Command for NVG tests previously conducted by the U. S. Air Force.

LWL began testing in September



Night vision goggles were evaluated while flying the AH-1G Huey-Cobra (below), the OH-58 Kiowa and the UH-1 Huey helicopters

Left: NVG showing the diopter, range, interpupillary and eye inset adjustments. Below, left: Face side view shows simple frame and exposed wiring

1971 and by January 1972 systems had been developed and tested for NOE night flight in all three modes. The UH-1 helicopter had been selected for the test-bed aircraft and had been modified with a radar altimeter and four 1.6 kilowatt searchlights which could be operated in either the visual or pink light (ir) mode. In addition, several features of the standard UH-1 had been identified as undesirable for night low level operation with or without use of the NVG. Briefly, these features were as follows:

• The light gray instrument panel reflects excessive light and impairs the pilot's ability to see outside the cockpit. A black low reflectance paint on the instrument panel and surrounding surfaces was highly effective in eliminating this problem.

• When flying low level at night it is often desirable to "black out" the cockpit. With the NVG at low ambient light levels, this is essential; however, it is also highly desirable to be able to turn on the instrument lights to a preset rheostat level of intensity with one "off-on" switch. LWL has connected the primary instrument lights and the pedestal lights to a single "off-on" switch on the overhead panel. This system allows the pilot to adjust these lights to a desired level with the rheostat switch and then turn all four sets of lights off and on with one switch, eliminating the requirement to operate and adjust four individual rheostats. Secondary panel lights and overhead panel lights were left in the normal operating mode as a safety feature in event of failure of the single switch.

• The low rpm, master caution and fire warning lights cannot be dimmed for night operation. When activated at low ambient light levels they blind the pilot both with the unaided eye and the NVG. A filter for these lights which prevents blinding the pilot is being developed for use with the NVG.

As a result of demonstrations conducted for MASSTER in February and April 1972, the decision was made to conduct a unit evaluation using only the third approach of the NVG alone. The use of searchlights in either the visible or pink (ir) mode was eliminated by MASSTER as being tactically unacceptable and requiring excessive modification to the aircraft.

In early June the Land Warfare Laboratory, with the cooperation of the Night Vision Laboratory, provided 10 sets of goggles to the 1/9th Cavalry. Training and instruction on modifications of the aircraft and SPH-4 helmet was provided by the author and Mr. Bert Stevenson, the LWL task engineer for CAVNAVS. As de-

Pilot wearing the NVG as adapted to use with the flight helmet. Velcro on upper strap is attached to the same material on the helmet surface

livered for testing the CAVNAV system consisted of:

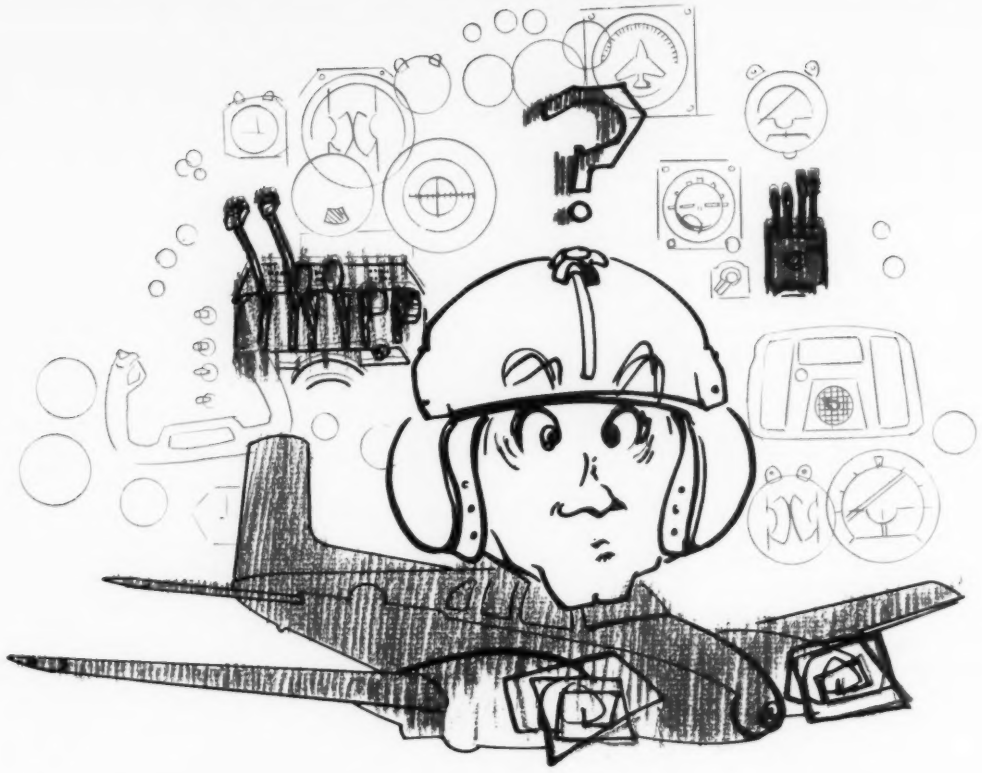
• The AN/PVS-5 NVG mounted in a face mask modified for mounting on the SPH-4 flight helmet.

• A modification kit for the SPH-4 helmet for mounting the NVG. The modification kit consists of two small patches of Velcro material for attachment to the visor cover and two snap fastener head screws used to replace two standard screws.

• Modification instructions for helicopter cockpits covering painting the instrument panel and surrounding surfaces with a black low reflectance paint. The single instrument light switch was not installed until later as the U. S. Army Aviation Systems Command safety release was still being processed.

Training for personnel selected to participate in the evaluation began with an orientation briefing on the system, including instruction on the method for mounting and adjusting the goggles. Following the briefing flight instruction was conducted for four instructor pilot personnel. The first training flight was a 1-hour daylight flight using a daylight NVG simulator. This simulator is designed to familiarize the pilot with the mounting and adjustment of the NVG and the problems encountered while flying with a 40-degree field of view (FOV). Except for an initial problem of relearning the old flight school adage of "keeping your head on a swivel," most pilots adjust to the 40-degree FOV very rapidly. Following the daylight flight each instructor pilot (IP) received an additional 1 hour of night instruction while using the NVG. After this instruction the selected IPs flew with each other for a period of 4 to 6 hours until they had obtained a "confidence level" with the NVG. Using these IPs as a nucleus, the remainder of the personnel selected for participation were trained by the 1/9th Cavalry.

Since June the NVG have been evaluated during various exercises to include the Cobra day/night tests. Flights have been conducted in the AH-1G HueyCobra, OH-58 Kiowa and UH-1 Huey series helicopters. Single ship and formation flights have been tested. The Cobra day/night tests have proven the goggles could be employed while firing the aircraft's weapons system. In December 1972 MASSTER recommended immediate adoption of the AN/PVS-5 goggles for both ground and airborne use. Thus, it appears with over 700 hours of successful flight testing to date, the CAVNAV system should provide the U. S. Army with an interim system for performing low level night flights under VFR conditions.



Cockpit Standardization

to prevent future mistakes

CW3 Chuck Hawk

HAVE YOU EVER wondered about aviation mishaps and cockpit standardization? I never gave it much thought until the day that I almost became an accident statistic.

At the time I was an instructor pilot (IP) assigned to an Army flight detachment that furnished aviation support to a major Army headquarters in the Continental United States. This flight detachment was equipped with both U-8F and U-8D fixed wing staff transports. The U-8D, which appeared in the Army inventory first, has located on the power console (in order from left to right) the propeller rpm controls, the throttles and the fuel mixture levers. The U-8F's console (in the same left to right order) has the throttles, followed by the propeller rpm controls. (The U-8F has an automatic altitude compensation system and idle cutoff switches which perform the same function as the U-8D's fuel mixture levers.)

Being the unit maintenance officer in addition to my duties as an IP in both aircraft, I had reason to fly both aircraft often—frequently the two models on the same day. I had been checked out first in the U-8F and had accumulated over 1,000 hours in that model before receiving a checkout in the U-8D.

On a hot, humid day in June I had first performed a maintenance test flight in a U-8F and then was scheduled to give a unit pilot a standardization ride in a U-8D. The first part of the ride went smoothly, with the pilot satisfactorily demonstrating his abilities in stall recovery, single engine work and various other upper air ma-

neuvers—both of a routine and emergency nature.

Upon returning to our home airfield to complete the ride with a series of touch-and-go landings, the control tower cleared us to enter downwind behind a large Air Force cargo aircraft which would be making a landing to a full stop. On downwind we performed a prelanding check, dropped our gear at the 90-degree point and turned base. At this time I cautioned the pilot to stay above the glide path angle of the preceding cargo aircraft and to plan our touchdown beyond the point at which it touched down, thus staying out of its prop wash and wingtip vortices.

On final we dropped some flaps and I looked inside the cockpit to make a final check that our gear was down and locked. Upon looking out again at about 100 feet above ground level, I noted that glide path angle was too low and that we were in danger of getting into the Air Force aircraft's turbulence. Just as I was starting to tell the pilot to add power and pull up, our aircraft felt like it had entered a full blown hurricane. It bucked, pitched and yawed wildly, standing on its left wing at what I thought to be in excess of 90 degrees. I yelled, "I've got the controls!" Immediately I pushed what I intended to be the propeller lever to the firewall, followed by an addition of power via the throttles. Simultaneously I applied full right rudder and aileron. The aircraft shuddered a few more times and then began to respond to the control movements. After I had gotten the aircraft's wings level and a climb commenced, I retracted the gear and flaps and called the control tower and informed them that I was making a go-around.

At this point the situation stabilized somewhat and I suddenly remembered in which order I had manipulated the power controls. I glanced down at the manifold pressure gauge and, sure enough, my suspicions were confirmed, because it indicated far in excess of the red line. I immediately reduced power and adjusted the propeller rpm, but I knew that the damage had already been done . . . that damage being two grossly overboosted engines.

The remainder of the trip around the pattern proved to be full of tension but, nonetheless, uneventful and a normal landing was made. As part of the postflight we called a technical inspector over while we ran up the engines. The seals of both superchargers were found to be blown and leaking fuel . . . a sure sign of an overboosted engine. Both engines had to be changed.

Looking back on what had happened, I find that I was a victim of circumstance that has plagued man from the beginning of aviation and even beyond. When man is faced with panic, confusion, an emergency or the like (or is just plain scared), his first reactions are highly influenced by his prior training and experience. In my case, having first checked out in the U-8F and having much more time in that model than the U-8D, I erroneously reacted to an emergency in the U-8D by applying the procedures for a U-8F.

This brings me to the point that I'd like to make: *the need for cockpit standardization.* As has been vividly and dramatically proven to me, cockpit standardization must not only be a desired feature of future Army aircraft but it also must be mandatory. It is too late to correct mistakes made in the past in this area, but it is an ideal time to prevent future mistakes. First, let's have a meeting of the minds to decide just what is the best layout or layouts of cockpits for fixed and/or rotary wing aircraft. Then in future procurement of Army aircraft let's insist that cockpits be standardized. If we can accomplish this a significant source of mishaps will be eliminated.

AVSCOM Comments

The following comments concerning this article were received from the U. S. Army Aviation Systems Command:

Cockpit standardization has been historically overlooked and this plea to improve standardization will be added to the myriad of earlier requests for improvement. In fact, progress is being made in that of the basic "T" of locating primary flight instruments in a standard manner and has been expanded to include all fixed and rotary wing aircraft cockpit controls for location and actuation.

International agreements are also being proposed to further minimize cockpit differences. These requirements are reflected in MIL-STD 203, MIL-STD 250 and Military Specification 33785 for cockpit layout, MIL-STD 1333 for cruise station geometry and MIL-STD 850 for external vision which only partially covers the listing.

AVSCOM would like to change one thought presented in this article. It is not necessarily too late to correct longstanding problem areas. In many instances minor approved field level relocation of instruments and/or controls coupled with additional corrections and redesign overhaul or retrofit would improve both the existing fleet and flight safety through standardization.

All current aircraft development programs—including the utility tactical transport aircraft system, the heavy lift helicopter and the advanced attack helicopter—the aircrew stations are being standardized according to the latest human factors engineering design criteria and practices as reflected in the new military specifications standards.

Aeromedical Potpourri

Provided by the Society of U. S. Army Flight Surgeons

A minor complication has existed when, for extra protection, an air crewman must use the SPH-4 and an earplug. An earplug traps air within the external ear. On ascent the air expands and tends to dislodge the plug. Upon descent the trapped air will decrease drawing the plug into the ear. Now a fix is at hand... the split earplug

Lieutenant Colonel Nicholas E. Barreca, M.D.

Aeromedic

U. S. ARMY AVIATION DIGEST

Figure 1

WHEN DEALING with the health and safety of aviation personnel it seldom hurts to repeat or reemphasize important protective measures. All of us periodically become forgetful, complacent or indifferent about the seemingly inconsequential nuisances and risks that attend our flying endeavors... that is, until we hurt or have a sobering experience. A little repetition might then be in order, especially when it can be seasoned by certain recent developments.

Combined Ear Protection: By now most air crewmen have realized the excellent protection inherent in the SPH-4 helmet. Certainly it provides the best noise attenuation available to date in an aviation protective helmet. By itself it is more than adequate protection for all personnel *except* those especially susceptible to noise induced hearing loss. Generally it protects the majority of air crewmen against all *but* some extraordinary exposures found under unique Army aviation noise conditions. Our ground support crewmen can also realize excellent noise protection from available earmuffs. Again however, special consideration must be given to more susceptible personnel and possible extraordinary noise conditions.

One might initially wonder what is meant by the "more susceptible individual." With many biologic functions or pathologic conditions of the human body, the risk of hearing loss follows the statistical bell shaped curve. This means that the majority of personnel exposed to a given hazardous noise situation will experience a certain amount of hearing loss with time. However, a certain percentage will experience more or less hearing loss than the average person . . . thus, we have respectively the more susceptible and the more resistant or tolerant persons. A good noise protective device will usually protect all but the most susceptible. To determine who is susceptible takes time. In Army aviation 2 to 3 years will often be required before susceptibility is established. For these individuals more than the ordinary

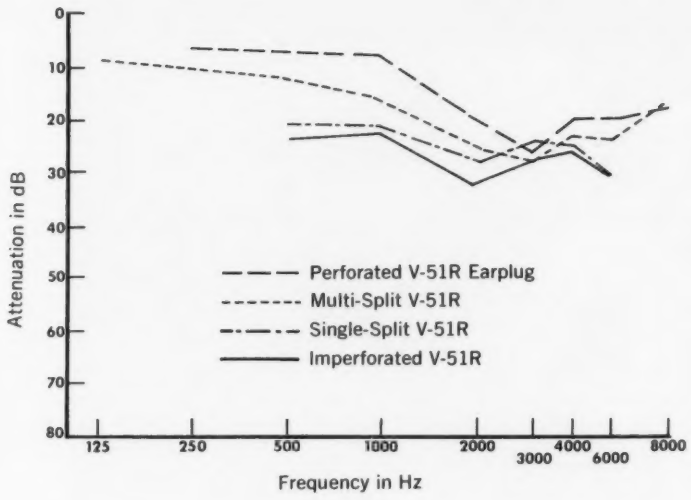


Figure 2

protection may be required to prevent or retard continued hearing loss.

Then there are the extraordinary noise conditions. Inside the OV-1D aircraft during certain engine maximum power checks and cruise conditions, noise levels in the lower frequency ranges approximate 130 dB. Similarly, certain flight conditions and crew positions in the CH-47C permit noise levels to approach exceptional proportions at specific frequencies. At these frequencies the SPH-4 lacks sufficient protection to reduce these extreme levels to within acceptable limits. On the ground a refueling technician radially servicing four "hot" UH-1Hs might be subjected to overall noise levels in excess of 110 dB. Another extraordinary situation occurs when the microphone switch is keyed . . . the so-called "hot mike." Under this condition as much as 115 dB overall external noise can be transmitted along with speech communication via feedback to our ears. In all of these situations additional noise protection might be advisable.

The solution for the susceptible individual or the extraordinary noise exposure is simply the combined use of the SPH-4 helmet or earmuff with an approved earplug. The most commonly used is the V-51R earplug (figure 1).

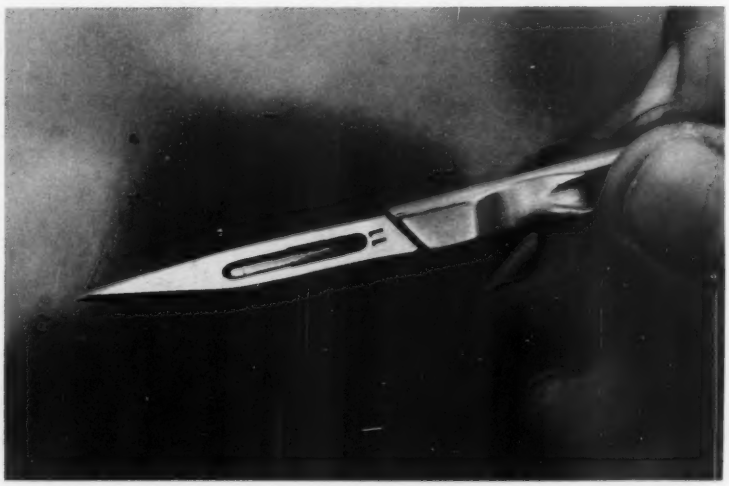
This earplug should be fitted to each external ear canal separately to achieve a comfortable fit and airtight seal. Pain after insertion frequently means a too small plug butting against the boney portion of the ear canal.

For the ground support crewman the simple addition of earmuffs over earplugs will enable the more susceptible individual to comfortably and safely perform routine duties in the usual noisy aviation environment, and the normal individual to more safely engage extraordinary noise exposures.

For the air crewman in flight a minor complication might be expected with the combined use of the SPH-4 and earplugs. An earplug, once inserted to produce an airtight seal, traps a parcel of air within the external ear. On ascent to altitude decreasing barometric pressure will cause this parcel of air to expand and tend to dislodge the plug . . . no serious problem by itself. On descent, however, a similarly trapped parcel of air will tend to decrease in volume drawing the plug into the external ear. This will result in pain and could conceivably, with rapid descent over a large pressure differential, drive the plug against the eardrum.

Until recently this was considered an insurmountable problem. *Now a fix is at hand . . . the split earplug.* The split enables the equalization of pressure across the plug between the covered external ear canal and outside air as well as with the middle ear. However, the

Figure 3



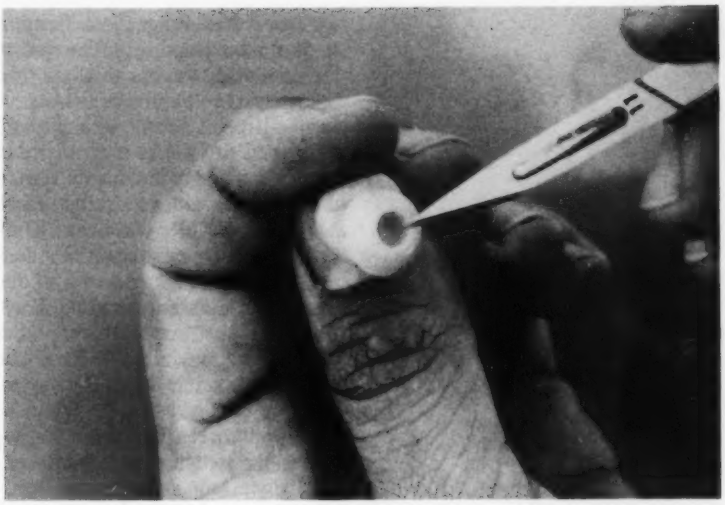


Figure 4

split must be carefully made. Only a 1 to 2 mm linear slit valve or "simple split" will permit pressure equalization *without* significant reduction in the plugs' ability to attenuate or reduce noise. A perforation, hole or ragged flapper valve will appreciably decrease the noise attenuation of the plug and is thus unsatisfactory (figure 2).

To construct a pair of split earplugs you should enlist the assistance of your flight surgeon. Ask him for a *number 11* surgical blade and scalpel handle (figure 3). Grasp the earplug exposing its face and septum. Spear the septum with the blade until a 1 to 2 mm slit traverses the septum (figures 4 and 5). Turn the plug around and spear the septum at the same angle on the other side to produce a through and through slit of uniform dimensions (figure 6).... Viola!... you have produced a split earplug. Now you can affect combined helmet and earplug protection with little care about changes in barometric pressure and with little loss in the effectiveness of the earplug. In addition, in the hot-mike situation, the plug will protect against feedback noise. Both speech commo and ambient noise will be decreased together, but speech intelligibility will increase, especially with a small increase in signal gain.

Figure 5

So, if noise induced hearing loss seems to be your companion, seek and use the combined protection so readily available.

Passenger Ear Protection: Intense noise is not only harmful to air and ground crewmen; it is also potentially harmful to passengers. Consequently, passengers should also be provided with adequate protection. This protection is available from the flight surgeon's office in the form of cotton impregnated disposable earplugs (FSN 6515-721-9092) or from normal supply channels in the form of earmuffs. Either should be on hand at airfield or heliport operations for distribution to passengers. The aircraft commander should brief passengers on the use of ear defenders. A simple reminder to loosen plugs during ascent or descent will take care of pressure equalization. In level flight a comfortable fit and airtight seal should be secured.

Sometimes passenger personnel will object to ear defenders because they feel it will interfere with reception of emergency signals or conversation. In actual fact the intelligibility of signals and speech is increased through earplugs or muffs in the presence of significant noise. So no excuses. Take the time to see that passengers are as well protected against noise as our fellow crewmen.

Helmet Chin Strap: In the February 1971 issue of the U. S. ARMY

Figure 6

AVIATION DIGEST, article entitled "Let's Keep Our Heads," a certain snap-fastener position was prescribed for SPH-4 chin strap attachment to maximize helmet retention and permit oxygen mask attachment. Since then the theoretical basis for that recommendation has come under scrutiny and reconsideration. A new recommendation has been agreed upon which embraces the concept that the smallest noose around the neck will provide maximum retention. Thus, the presently recommended position of the chin strap for the SPH-4 helmet is the lowermost snap fastener on each side of the helmet (figure 7). For the air crewman who might conceive the unusual or exceptional situation, the following recommendation is offered: *The chin strap should be attached to the lowermost snap fasteners that permit a snug approximation of the jaw and are consistent with comfort, speech and/or oxygen mask attachment.*

Remember the *three most important steps* that will maximize SPH-4 retention and result in desired head protection if they are practiced each time the helmet is donned.

- Eliminate *all* chin pads.
- Snug up the chin strap.
- Cinch up the nape strap—*let's keep our heads.*

Wither Thy Footstool: The SPH-4 was designed to sustain and attenuate crash forces directed at its hard outer shell. Although many other characteristics and functions were considered and included in its production model, none permit the helmet to be effectively used as a foot rest, portable seat, carryall or sling without compromising its protective strength. Inconsiderate uses such as these place stress upon the helmet's retention system and outer shell that it was not designed to handle on a day-to-day basis. Some might scoff saying, "If the helmet can't sustain these forces, how can it handle crash forces?"

A few examples will help answer this. The expansion of the SPH-4 helmet shell to accommodate the ear cups was designed to flex out to permit easy donning. The flexion line is slightly weaker to allow this, but doesn't compromise the protective aspects of the helmet shell. However, if forces are directed upward through the lower rim of these Mickey Mouse ears, cracks at the flexion lines will occur. During an emergency situation the helmet would not sustain forces in this manner. Crash forces should address the shell from the top and sides or be transmitted through the retention system. Similarly the retention system should only be stressed during an emergency rather than daily through the excessive wear of abuse.

- Protective helmets are not foot or piano stools.
- Protective helmets are not receptacles or handbags.
- Protective helmets are not slings.
- Protective helmets are *helmets* and should be treated carefully.

For History Buffs: In accordance with a prior specific DA message, the SPH-4 helmet is now the only acceptable helmet for air crewmen. It is standard A. The AFH-1 and APH-5 helmets are standard B. The Surgeon General has deter-

Figure 7

mined that the standard B helmets are potentially hazardous and do not provide adequate sound attenuation for protection against hearing loss. Sufficient SPH-4 helmets are available to equip all Army air crewmen and will permit exchange of the obsolete standard B. Thus, the APH-5 and AFH-1 helmets should only be of interest to supply personnel and *curators of aviation museums*. Air crewmen who have become so emotionally attached to their *old* helmets that they persist in wearing them would do well to consider the personal implications of this retrospective and retrogressive tendency. Further, they should contemplate the existence of other museums that exist to display pathologic specimens and failure of life support equipment. Do not risk becoming an example to fellow air crewmen. Turn in your old, memory laden, obsolete helmet for the SPH-4. Better yet, submit it to the U. S. Army Aeromedical Research Laboratory for their life support equipment exhibit along with sentiments and war stories. They'll display them in consideration of your increased protection.

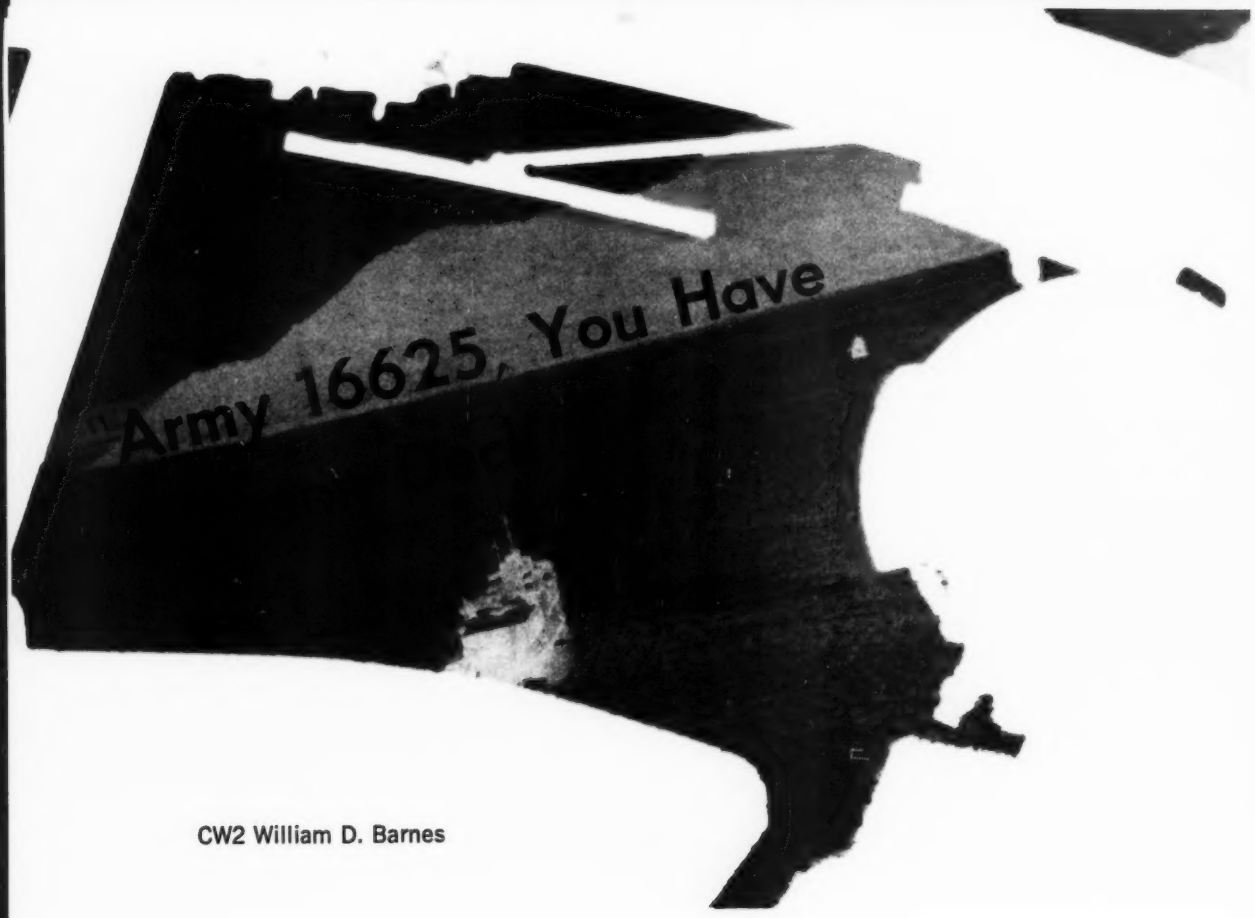
Crash Positions: In the event an emergency landing becomes anticipated, each occupant of a troop or passenger seat *not equipped with a shoulder harness* should assume the forward-folded knee-chest position. This protective position is effected by bending forward at the waist with feet firmly on the cabin floor. The chest rests on the knees and the position is held by enfolding and locking the arms around and behind the thighs with the hands. The head is placed face down between the knees (figure 8).

Assumption of the position will likely reduce flailing of the head, arms, legs and upper torso during abrupt deceleration thus preventing injury. It will reduce whiplashing of the cervical, thoracic and lumbar spine decreasing the likelihood that vertebral fractures will occur. Further, it will tend to reduce the G-forces sustained by the occupant's seat and thus decrease the likelihood that seat failure will occur.

Figure 8

Aircraft commanders are encouraged to brief the occupants of troop or passenger seats in the use and benefits of this position prior to flight. All air crewmen likely to occupy such seats are encouraged to practice the assumption of this protective position so that it will become an automatic response when it is needed.

Fly Safely—Fly Protected—Fly Army

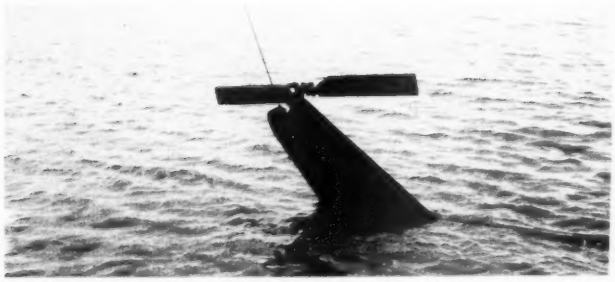


Army 16625, You Have

CW2 William D. Barnes

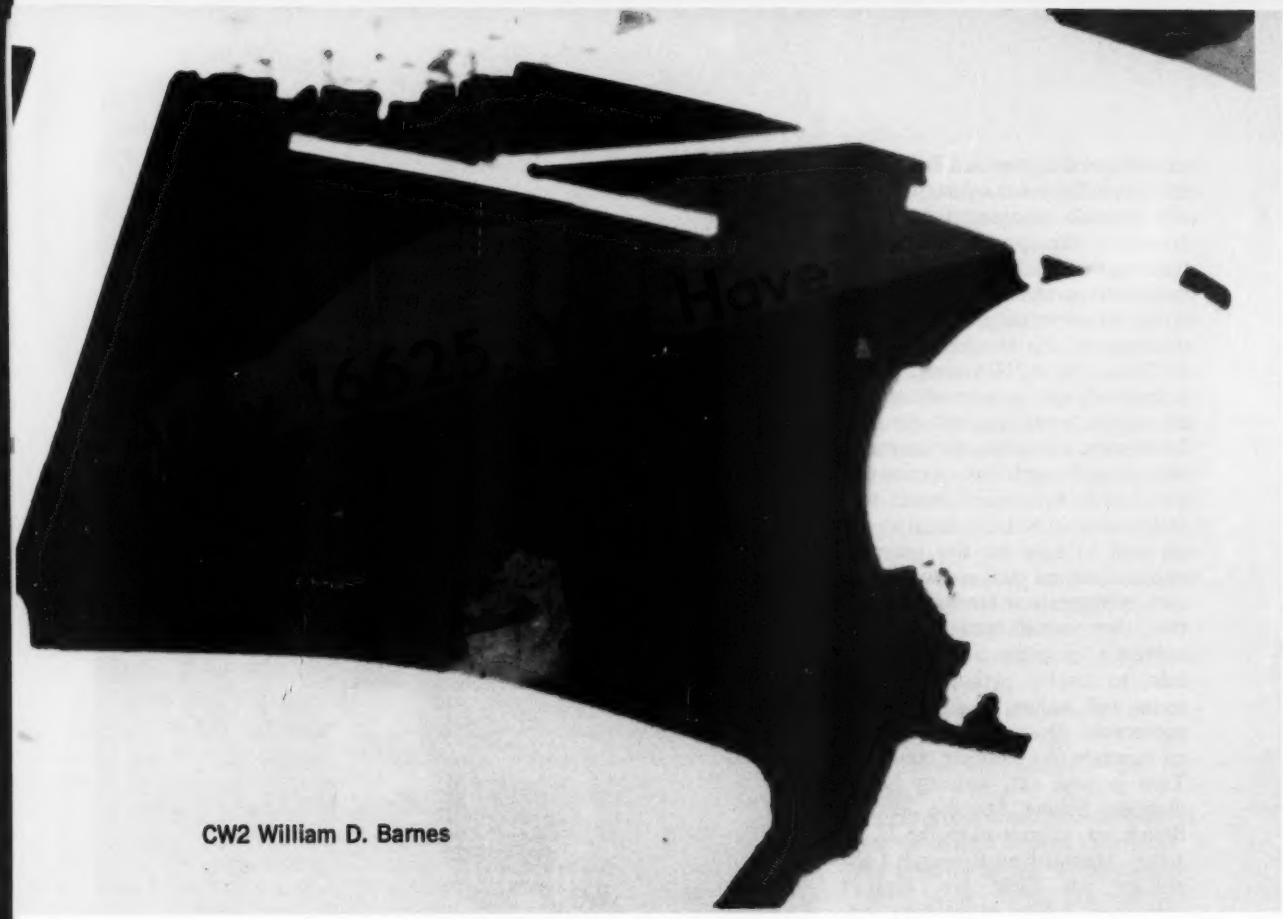
Those Army aviators proficient in landing on moving flatbed trucks will find this article to be of little interest

Others had better read on . . .



IF GIVEN A MISSION that required aircraft operations involving a naval vessel, how many Army aviators would know and understand the aviation terminology and procedures used by the Navy or Coast Guard? It has been my experience that most confronted with this situation for the first time were not sure of the proper procedures and required a special explanation of landing and other instructions. Aircraft operations to and from ships have some peculiarities which are unique to naval operations, unless you might know of anyone who has landed on a moving flatbed truck.

Why bother going to the trouble to instruct Army aviators in naval aviation operations, when Army aviators will probably never land on a ship? In situations such as those encountered in the Republic of Vietnam, the frequency of Army aircraft operating from naval vessels has been more common than one might think. If my personal experiences are any indication, I feel it would be beneficial to the Army and the Navy to provide at least some classroom instructions to Army aviators to familiarize them with Navy procedures and phraseology for aircraft operations. I feel the possibility of a mishap involving an Army aircraft in this



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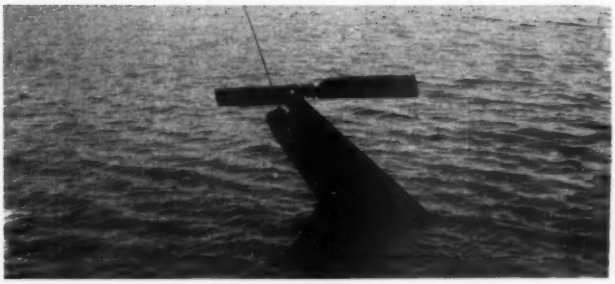

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environment would be greatly reduced with just minimal instruction on the subject.

My first experience involving a ship was as a pilot of a UH-1 Dust-off helicopter flying a patient to a hospital ship in Da Nang harbor. It was a fairly easy operation because the ship was at anchor and in a sheltered harbor. However, conditions unfortunately are not always so ideal. My aircraft commander was from the midwestern United States and about the biggest boat he had had any contact with at all was a canoe. When the ship told us we had a "green deck for a port quarter approach" my aircraft commander looked at me in a very preplexed manner and then asked the ship to repeat in English. There was a slight chuckle and then we were told to fly around to the back on the left side and land to the right front. On final we could see the guide on the deck with a couple of flags to tell us where we were in relation to the proper glide slope and alignment with the deck. The approach was simple enough, once we understood the instructions.

During my tour of duty in Vietnam I made several more trips to hospital ships and flew a few missions to ships working off the coast. One mission involved a hoist because the ship was relatively small and did not have a deck large enough for landing. The weather was poor and the water rough. The wind was about 25 knots. The ship turned so that the wind was off the bow and slowed to 10 knots, which was the slowest it could move and still be able to maneuver in the rough seas. Imagine hovering down a road at 30 knots trying to get a forest penetrator on the back of a moving flatbed truck. The penetrator had to be on the deck long enough for the injured man to be strapped to it. It was somewhat like chasing a yo-yo. Possibly if I had had more knowledge of naval operations, the mission would have been easier and safer.

Flying over water creates a definite problem with depth perception. This can be demonstrated by dropping a smoke grenade and trying to guess the moment it will hit the water. During the hoist mission mentioned I had to use the ship as a reference and it was constantly pitching up and down. An incident which produced aircraft damage occurred in my unit and involved a hoist from a small naval vessel. The ship dipped into a swell and the penetrator lifted off the deck and hooked a railing on the ship. When the pilot felt the aircraft descending he applied power to stop his descent which resulted in an overtorque. A remedy for this is to give the penetrator plenty of slack after it hits the deck. When ready to lift have whoever is running the hoist keep a watchful eye on the penetrator and clear the ship as fast as possible using aircraft power and the hoist motor.

Every time I have landed to a ship underway, the ship was always turned so the wind was off either side of the bow. This will give a relative headwind when using either a port (left) or starboard (right) quarter approach. The approach is flown at about 45 degrees to the ship's heading from one side of the stern to the opposite side of the bow. It appears very similar to a crosswind approach. However, instead of the wind creating the alignment problem, your landing site is constantly changing its position. Even though the ship is moving, once on short final there is no sensation that you are actually moving sideways because your entire reference is moving with you.

On short final the approach is surprisingly normal. After touchdown, if you are going to remain onboard for any time at all the aircraft should be chained down. Remember to check that all the chains have been removed before takeoff. You will be directed to shutdown by radio and hand signals. If the ship's crew is not familiar with Army aircraft you might be directed to brake the rotor. The hand signal is a forearm held perpendicular to the deck and moved up and down. A quick explanation of the problem is all that is needed. A flight school pinnacle takeoff also works nicely from ships.

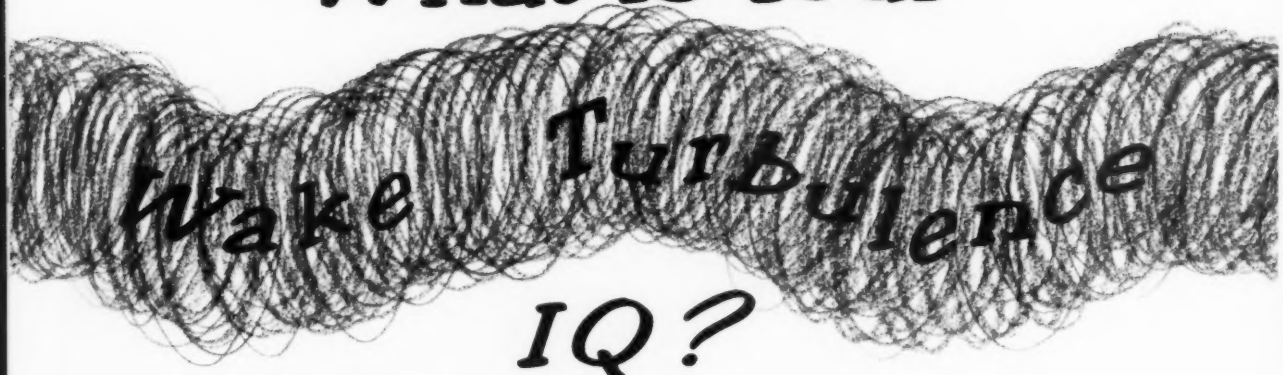
Take care not to dive for air speed once clear of the deck. An OH-6 pilot told me of an instance where he hovered over to the edge of the deck, dived the aircraft for air speed and continued to low level around the ship for a typical scout look around. Navy pilots don't usually depart in that manner and the recovery crew got quite concerned until the LOH popped up on the other side of the ship, no worse for the wear.

Finding a ship at sea can be a problem if it is far enough out so that you can't see it from land. It is no problem, however, if you can establish FM homing procedures with the ship. An even better procedure is to be identified by the ship's radar personnel and let them vector you to their position. This gives them a positive position for you at all times in case something should happen and you have to ditch.

Remember the ditching procedure for your aircraft? Also, don't forget life preservers and overwater survival gear.

On just about every ship I've ever landed, I've been asked to shut down and tour the ship. If the opportunitv ever presents itself and time permits, I suggest taking advantage of the invitation. If you happen to arrive around chow time, you will probably be asked to stay . . . and the food is always good. The Navy has been known to ask Army pilots to stay for lunch even though they've slipped up and called the ship a "boat."

What Is Your Wake Turbulence IQ?



Recent flight tests have revealed that vortices may be generated with tangential velocities of 150 feet per second (or 90 knots). The greatest vortex strength occurs when the generating aircraft is heavy, slow and in clean configuration. Army aviators need to learn all there is about wake turbulence since someday they may be on the receiving end of it

Tom Hawthorne, DAC

Aviation Academic Instructor
USAAVNS, Ft. Rucker, AL

LISTED BELOW ARE 10 multiple-choice questions which reflect the latest findings by the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) concerning wake turbulence. Check your answers against those at the end of the test. Credit yourself with 15 points per correct answer and if you have a score of 150 you have a high wake turbulence IQ. If your score is less than 135 you'd better keep reading.

1. When departing behind a large cargo aircraft, which of the following types of wind would result in the most persistent runway turbulence?
   a. Calm winds.
   b. Direct headwinds.
   c. 5-knot crosswind component.
   d. 10-knot crosswind component.

2. During a calm winds condition a jet aircraft departs on runway 36L. When should an aviator expect the turbulence to reach 36R if the distance between the two runways is 1,000 feet?
   a. ½ minute.
   b. 1 minute.
   c. 1½ minutes.
   d. 2 minutes.

3. When does a departing aircraft start producing wingtip vortices?
   a. At the start of the takeoff roll.
   b. At an approximate speed of 60 knots.
   c. When the nose is first rotated.
   d. At liftoff.

4. What conditions of air speed weight and configuration would generate the greatest amount of wake turbulence?

	Air Speed	*Weight*	*Configuration*
a.	Slow	Heavy	Flaps down
b.	Slow	Heavy	Clean
c.	Fast	Heavy	Flaps down
d.	Fast	Heavy	Clean

5. At what rate and to what altitude will the vortices generated by an aircraft descend?
   a. 500 fpm for 900 feet.
   b. 500 fpm for 500 feet.
   c. 1,000 fpm for 2,000 feet.
   d. 1,000 fpm to ground level.

6. The major danger associated with the high exhaust velocities of large jet aircraft would be present during which type operation?
   a. Landing.
   b. Takeoff.
   c. All flight operations.
   d. Ground operations.

7. When taking off behind a departing jet aircraft a good technique would be to—

a. Lift off prior to the point of rotation of the jet and stay above or away from its flight path.

b. Delay liftoff as long as possible to create excessive air speed for penetration of the vortices.

c. Climb to 500 feet, level off and turn so as to cross the vortex path at a 90-degree angle.

d. Adjust the flight path so as to penetrate the vortex core 500 feet below the generating aircraft.

8. Generated vortex cores range in diameter from 25 to 50 feet. How are the two vortices of an aircraft affected by time?

a. The cores rapidly expand until they overlap and dissipate.

b. They stay very close together with little expansion until dissipation.

c. They gradually reduce in size until dissipation.

d. Depending on the atmospheric conditions, they sometimes increase or decrease in size.

9. Which of the following tangential velocities would approximate those created by the C-5A or Boeing 747?

a. 500 fpm.

b. 5,000 fpm.

c. 9,000 fpm.

d. 15,000 fpm.

10. Which of the following encounters with wake turbulence would probably result in the greatest loss of control of the penetrating aircraft?

a. Crossing the wake at a 90-degree angle.

b. Climbing through the wake at a 90-degree angle.

c. Climbing through the wake on the same heading as the generating aircraft.

d. Flights 1,000 feet below the generating aircraft.

Answers: 1. c; 2. d; 3. c; 4. b; 5. a; 6. d; 7. a; 8. b; 9. c; 10. c.

Recently much interest has been generated concerning the possibility of increased wingtip vortices behind the super jet transports such as the C-5A and Boeing 747. Both NASA and the FAA are engaged in an ambitious program to determine the true nature and intensities of these vortices. They are further engaged in the development of aerodynamic methods of vortex elimination or reduction, devices and methods of detection, and operational procedures to cope with the existence or nonexistence of the vortices. Many of their findings are presented in this article along with FAA recommendations concerning pilot techniques to cope with suspected vortices.

It would be easy for an Army aviator to ignore such recommendations or else fail to adequately study them by thinking "we have no Army aircraft capable of producing strong vortices." Such a line of thought would be erroneous in two respects: First, we do have aircraft such as the CH-54 and CH-47 capable of producing strong vortices; and second, it is the *recipient* rather than the generator of vortices who experience the

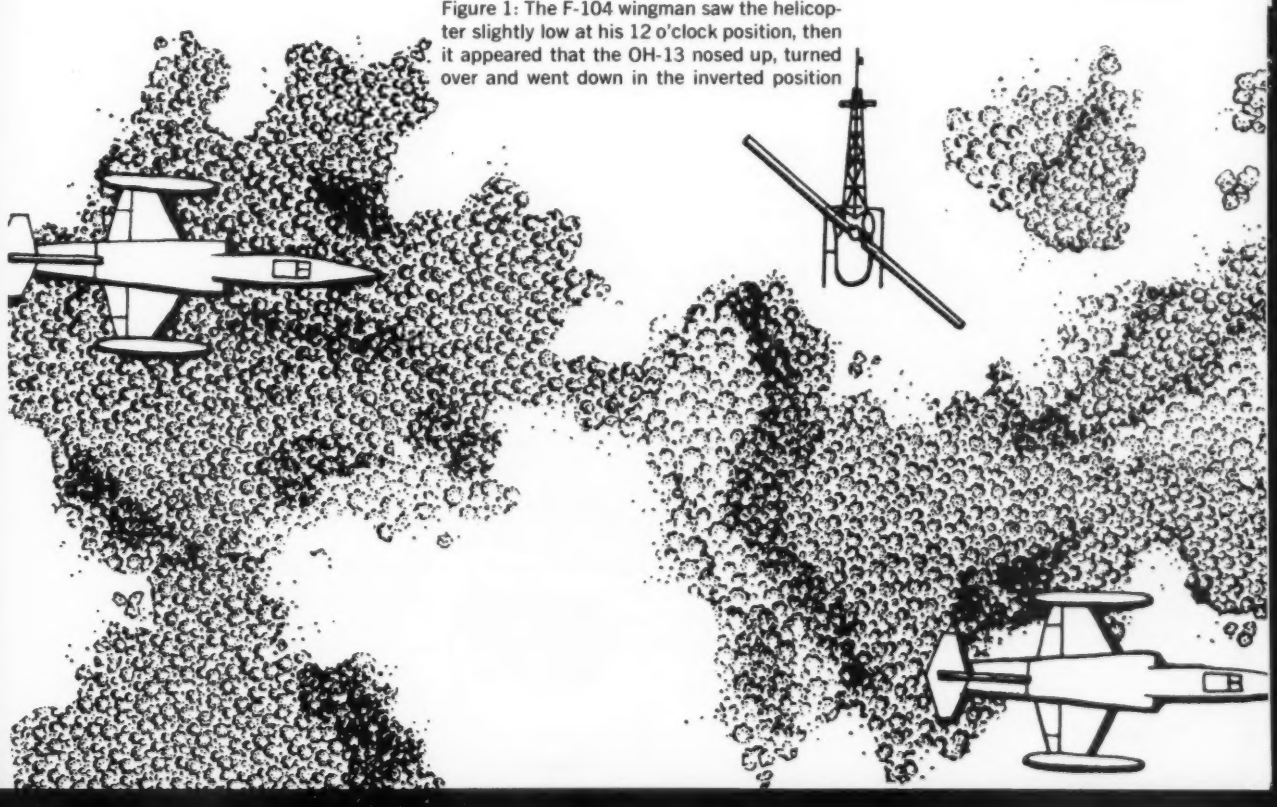


Figure 1: The F-104 wingman saw the helicopter slightly low at his 12 o'clock position, then it appeared that the OH-13 nosed up, turned over and went down in the inverted position

Figure 2: The major wake is created through the production of lift. Airfoils produce lifts (low pressure area) which is greatest on the upper surface

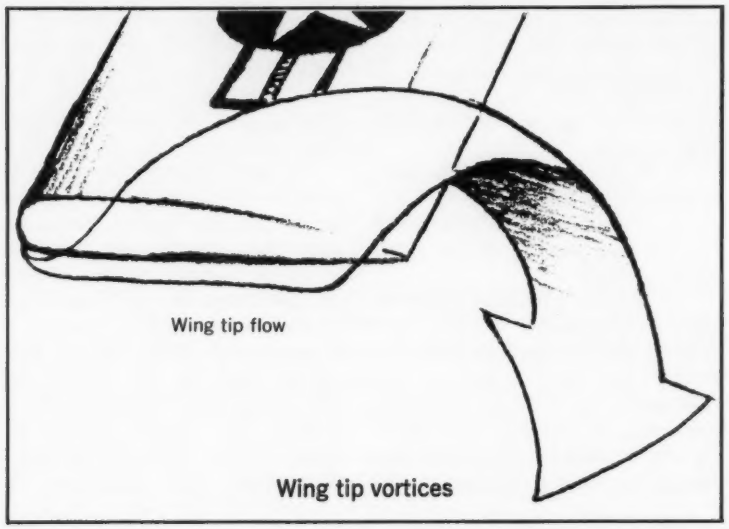


Figure 3: At the wingtips (left) air tries to flow to the upper wing surface where low pressure exists, causing a vortex or swirl of air

devastating effects.

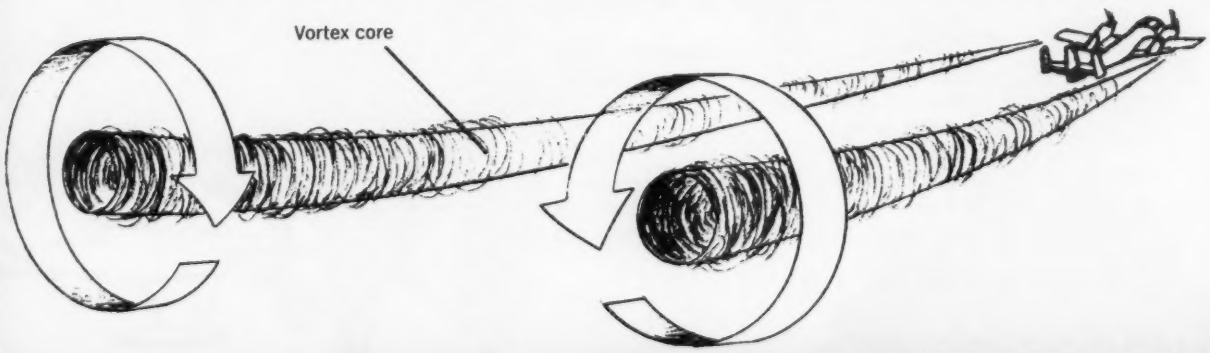
One of the most thoroughly documented accounts of the effects of the vortex action on small Army aircraft was recently recorded in Europe. Two North Atlantic Treaty Organization (NATO) F-104A jet fighters were flying formation at 800 feet AGL on a heading of 092 degrees when the flight leader reported to his wingman a helicopter (OH-13) flying south at his 0830 position. The wingman spotted the helicopter slightly low at his 12 o'clock position in a level flight attitude (figure 1). Just as the helicopter reached the 6 o'clock position of the lead jet it appeared to the wingman that the helicopter nosed up, turned over the longitudinal axis, banked about 45 degrees and went down in this inverted position. The aircraft fell straight through 80-foot trees killing the pilot on impact and creating a postcrash fire.

The major cause factor of the accident was listed as "inadequate flight of the helicopter into the vortex effect of the jet fighters' wake with subsequent loss of control." One of the major recommendations offered was that all pilots now in U. S. Army, Europe (USAREUR) and all incoming pilots attending the USAREUR Orientation Course be briefed on the vortex effect behind large high-speed aircraft.

The above case was cited because it was documented and resulted in a fatality and total loss of an aircraft. Many unreported encounters with wake turbulence occur daily and have the same potential as the one above. With this in mind let's review the cause of wake turbulence and compare earlier beliefs with the latest findings of the FAA.

Every aircraft generates a wake

Figure 4: Vortices produced are counterrotating with a core of 25 to 50 feet in diameter. The core size remains essentially constant



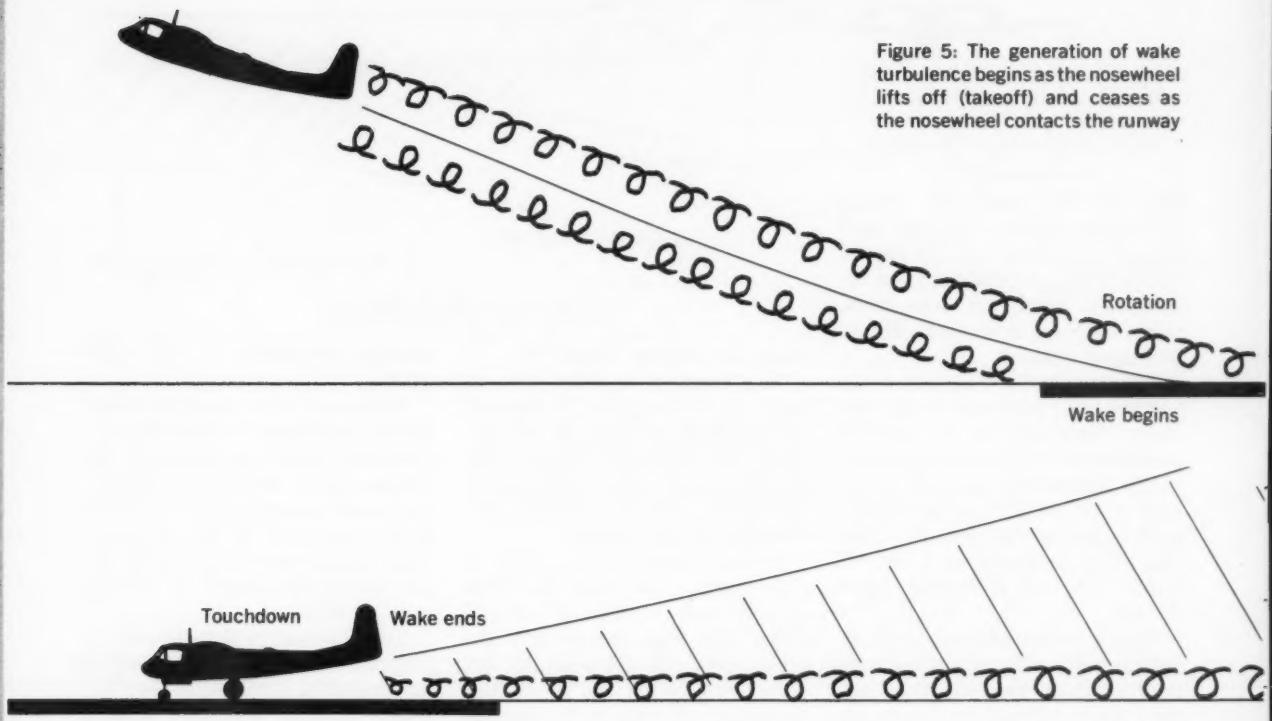


Figure 5: The generation of wake turbulence begins as the nosewheel lifts off (takeoff) and ceases as the nosewheel contacts the runway

while in flight. Originally this wake was believed to be formed by the propeller blast and was called "prop wash." It is now known that prop or jet wash is only dangerous a few feet aft of an aircraft with the major wake created as a result of the production of lift. Lift is produced by creating a pressure differential between the upper and lower surface of the wing with the lowest pressure existing on the upper surface (figure 2).

At the tips of the wings there is a *spillage* or flow of air from the lower to the upper surface in an attempt to equalize the pressure differential. Because the wing is constantly moving and maintaining the pressure differential, equalization of pressure never occurs; however, a vortex or *swirling* spiral of air is created behind each wingtip (figure 3).

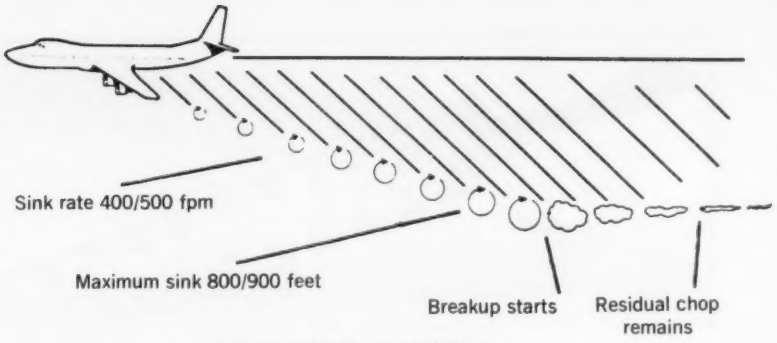
The two vortices are counter-rotating and the size of the core ranges in diameter from 25 to 50 feet depending upon the size and shape of the generator. The total area of influence is not limited to the core, but that is where the greatest tangential velocities exist (figure 4).

Contrary to earlier beliefs, the size of the core remains relatively constant with time and the two vortices remain very close together until dissipation. This newly found knowledge can be useful because if persistent wake turbulence is encountered a slight shift in horizontal flight path will generally take the aircraft out of its influence.

The strength of the vortices depends primarily upon the size and shape of the wings and the pressure differential at the tips. Heavy, slow aircraft obtain their needed lift by operating at high angles of attack which produce large pressure differentials and strong vortices. When flaps are lowered the greatest pressure differential is shifted more toward the root of the wing resulting in a slight reduction in vortex strength. Summarizing, the greatest vortex strength occurs when the generator is a heavy, slow and clean aircraft. Recent flight tests have produced vortices with tangential velocities of 150 feet per second. This can be translated as *90 knots or 9,000 feet per minute.*

The generation of these vortices starts when the nosewheel first leaves the ground during takeoff (rotation) and ceases when the nosewheel contacts the runway after landing. A knowledge of this phenomena allows a pilot to adjust his flight path when taking off or landing behind an arriving or departing vortex generating aircraft (figure 5).

It was previously thought that the vortices produced by high flying aircraft immediately started sinking and continued to sink until the two vortices expanded, overlapped and destroyed each other. Recent tests with smoke generators have revealed that the generated vortices descend 400 to 500 feet per minute for a distance of only 800 to 900



Vortex sink characteristics

Figure 6: Vortices sink 400 to 500 feet per minute for a distance of about 900 feet, however, the rotation continues until dissipation

feet. At that point the sinking ceases but rotation continues until dissipation (figure 6). The rate of dissipation is dependent upon atmospheric conditions with calm, stable air being most conducive to prolonged duration.

At low altitudes the action of the vortices were proven to be as originally theorized. In a no-wind condition the vortices descend vertically behind the generating aircraft at 400 to 500 feet per minute until reaching the ground. Then they move outward at a rate of 4 to 5 knots until dissipated (figure 7).

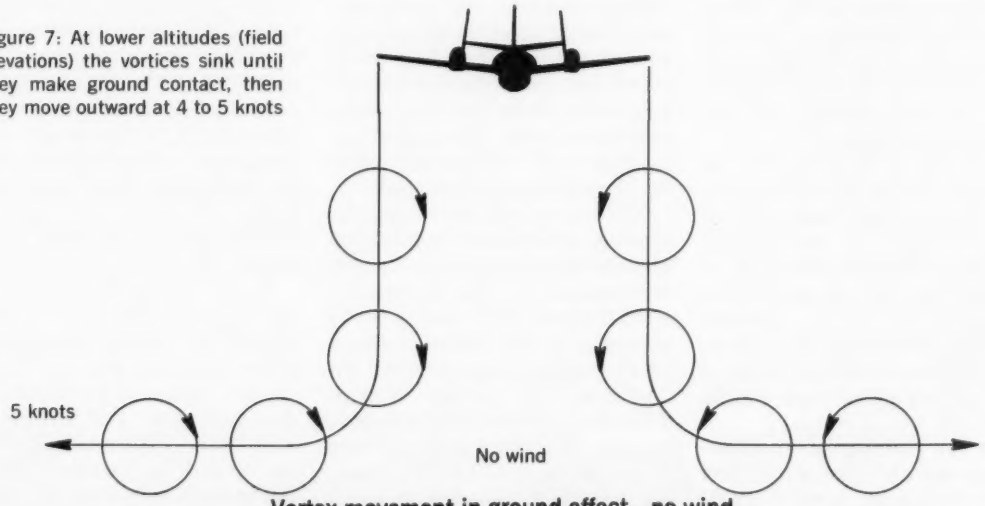
With a crosswind component the sinking vortices move with the wind until reaching ground effect and then move outward at a rate according to their inherent movement and the crosswind components. A crosswind of 4 to 5 knots would produce the most persistent runway turbulence in that one vortex would move away at 10 knots and the other would remain stationary along the runway (figure 8).

Encountering a wake may or may not be hazardous; it depends on the initial strength of the vortices, the distance behind the generating aircraft, atmospheric conditions and the position and direction of penetration.

If the penetration is made at right angles to the wake, the result may be only a series of up and down jolts with the severity depending on the strength of the vortex and the type of penetrating aircraft. If the wake is encountered at angles nearly parallel to the generating aircraft, the tangential velocities of the wake may induce a roll beyond the control capabilities of the aircraft (figure 9). Aircraft with a short wing span such as many Army models are extremely susceptible to this type hazard.

Although it is possible under certain conditions to produce acceleration forces in excess of the designed stress limit of the aircraft, the major hazard is loss of control *in the vortex roll at low altitudes.* This flight situation most often occurs during the takeoff or landing stage of flight.

To minimize wake turbulence hazards, FAA and Army controllers provide a 5-mile separation for lighter aircraft operating behind and at the same altitude, or within 1,000 feet below a heavy jet such as the C-5A or Boeing 747; provide a 2-minute interval for lighter aircraft departing behind a heavy jet, both IFR and VFR; and issue precautionary advisories to VFR



Vortex movement in ground effect—no wind

Figure 7: At lower altitudes (field elevations) the vortices sink until they make ground contact, then they move outward at 4 to 5 knots

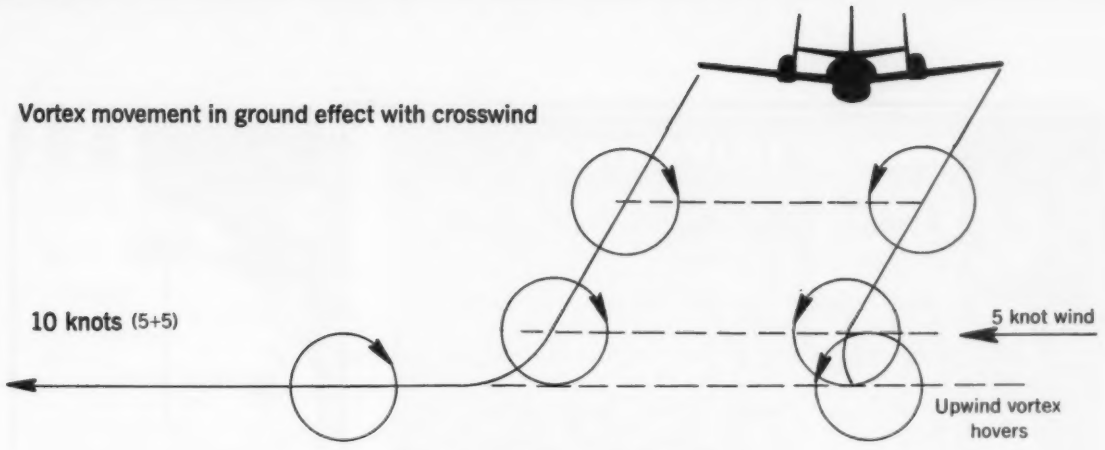
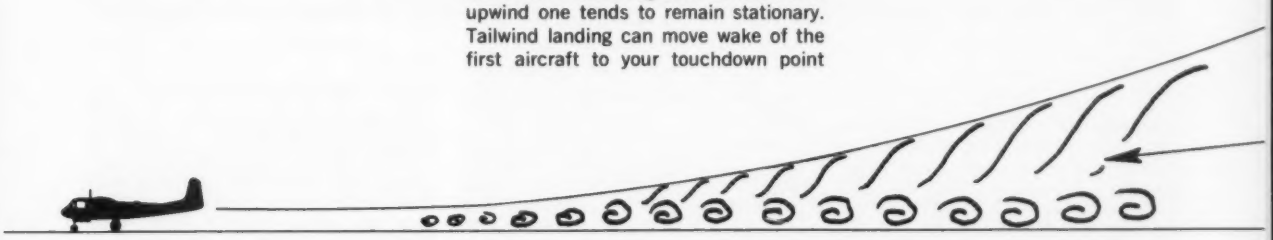


Figure 8: In 5-knot crosswind vortices move with wind until ground contact, then upwind one tends to remain stationary. Tailwind landing can move wake of the first aircraft to your touchdown point



Tail wind can move vortices to your touchdown point

aircraft on potential wake turbulence when deemed advisable.

The FAA emphasizes that when the controller advises *"Caution, wake turbulence"* he is following a procedure to alert the pilot of its possible existence. *The pilot is expected to adjust operations and flight path to preclude serious wake encounters.*

The FAA has recommended procedures for different situations to minimize the danger of encountering wake turbulence. [See last month's AVIATION DIGEST article entitled "Visualize The Invisible," page 40. Next month, look for "The Illusive CAT" (clear air turbulence) the third in this series on turbulence.]

Why not read the stories and increase your wake turbulence IQ?

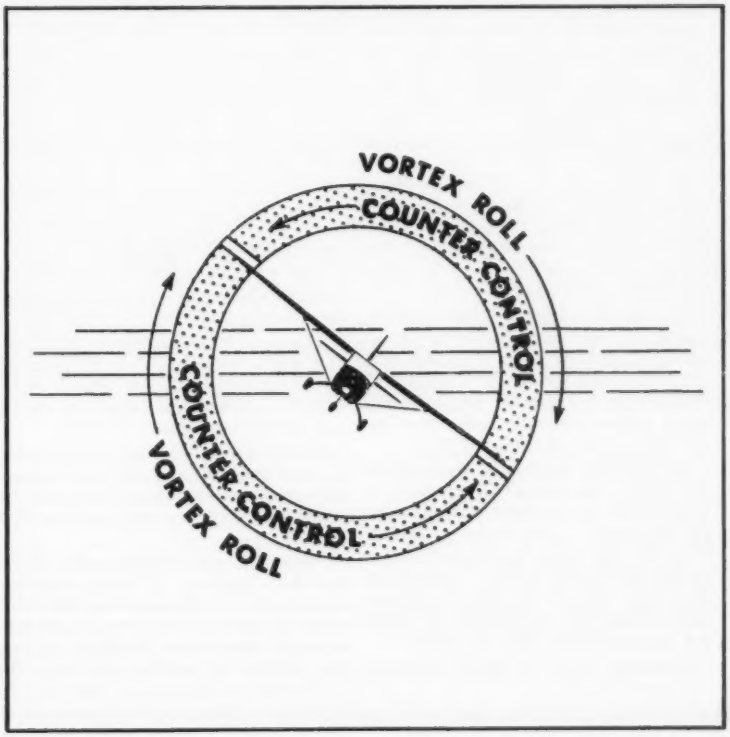
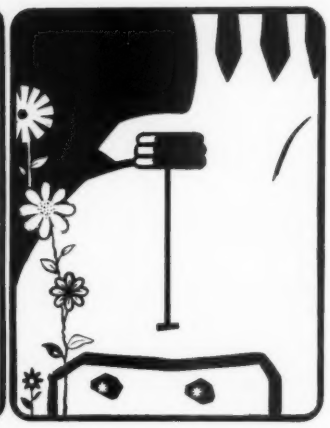


Figure 9: Tangential velocities of wake, when encountered nearly parallel to the generating aircraft, may induce a roll exceeding control capabilities of the aircraft

VIEWS FROM READERS



Sir:

Having served as commander of Contact Flight Division, Department of Advanced Flight Training, U.S. Army Aviation School (USAAVNS), Ft. Rucker, AL, for 18 months, I recently asked the division aviation safety officer, Captain Busbee, to compile our flight operations statistics for the past 17 months. The statistics are quite revealing and we feel that the record we have established probably stands unmatched. In view of the number of landings, the type landings and flying hours that we have remained accident-free, we issue a challenge to any unit in any service to attempt to show they have amassed a similar record.

Contact Flight Division is one of three flight divisions which form the Department of Advanced Flight Training at USAAVNS. Each flight division is an entity in itself with its own specific training responsibilities; therefore, each flight division conducts its own unique training program. The Department of Advanced Flight Training is the only department at USAAVNS engaged in flight training for initial entry students.

Contact Flight Division's program of instruction is designed to qualify initial entry flight students in the UH-1 helicopter, the aircraft in which the great majority of Army aviators eventually become operational. The training we conduct includes all normal and emergency flight procedures, including night flight, unimproved confined area operations and contour flight. A glance at the table below, showing some of the maneuvers we perform, will reveal why we feel that this division is exposed to a much higher than normal accident potential.

During the period 16 September 1971 through 31 January 1973, Contact Flight Division has experienced no aircraft accidents while flying 62,861

Shaun Fowler, 2½, will never forget the ride in the Army helicopter he took last February. His mother, Mrs. Claude R. Fowler, would be just as happy if it doesn't happen again . . . under the same type of circumstances.

Shaun, according to his mother, wandered off from the family home in Whetstone Estates, north of Benson, AZ, at about 1100 hours. The family and friends searched the area for about 1½ hours before calling for help from the Cochise County sheriff's office.

About 1330, as part of their search procedure, the sheriff's deputies requested helicopter search support from Ft. Huachuca's Libby Army Airfield.

A UH-1H Huey helicopter, piloted by Captain Johnny Stewart, Libby AAF operations officer, was dispatched and flew an assigned search pattern in the J-6 Ranches area with no results.

However, when the search crewmen spotted a sheriff's car in the area, they landed and obtained further details and a more complete description of the youngster.

One item of information proved valuable—Shaun was reported to have two pet dogs with him.

The search mission took off again, and within 10 minutes one of the dogs was spotted from the air. They landed, found Shaun and the other dog nearby and picked up the entire coterie.

Within minutes the helicopter landed in the Fowler front yard with its precious packages, delivered Shaun to the waiting arms of his parents and returned to base.

"Just before the sheriff's office called we had received a severe weather warning," CPT Stewart recalled. "But when we learned that it was a lost child we were determined to search as long as weather permitted, and boy, the weather was nasty up there."

Stewart and his crew—Chief Warrant Officer Donnie B. Gates, the copilot, and Specialist 4 Van Morris, the crewchief—also said that Shaun's initial reaction to the helicopter was not too favorable.

"When we landed I ran over to him and he was screaming with fright. I got him calmed down a bit and asked him what was the matter," Stewart related. "Pointing toward the helicopter some distance away he said, 'It's after me.' However, when I reassured him, he lost his fear right away."

The two dogs were more reluctant to take a ride in the "fearsome beast," but were finally convinced.

"I could have left the dogs, but I thought Shaun would feel better if they were with him," Stewart said. "He's a great little guy and I'm sure glad we found him right away."

hours, graduating 2,071 students. The table below indicates some of the maneuvers performed daily and the number of times each has been performed with students during this period:

Maneuver	*Times Performed*
Autorotations	
Day Standard/Low Level	155,325
Night Standard	12,420
Hovering	196,745
Sod Touchdown/Simulated Forced Landings	83,146
Simulated Antitorque System Malfunction	62,130
Simulated Hydraulic Flight Assist Failure	103,550
Confined Area/Pinnacle Operations	41,420
Normal/Maximum Performance Takeoff/Landing	124,260
Total Takeoffs/Landings	778,996

In addition, Contact Flight Division is at present responsible for administering periodic standardization flights to instructor personnel which would increase the totals given above.

To achieve a perfect accident-free record has required the cooperation and participation of all personnel concerned, from each individual student on up. We feel that the key tangible factors are the interest and supervision contributed from all levels of command, including the individual instructor, coupled with the implementation and maintenance of an intensive instructor standardization program. Of equal importance are those intangible factors, such as the attitude toward safe mission accomplishment that has become "a way of life" within the division. Just as it is our responsibility to impart the knowledge and mechanics each student requires to operate the aircraft, it is our responsibility to foster in him these attitudes so that the Aviation School continues to produce even more professionally qualified aviators.

We, in Contact Flight Division, are proving every day that even the most hazardous types of flying can be done safely.

LTC Howard E. Haney
Cmdr, Cont Flt Div
DAFT, USAAVNS
Ft. Rucker, AL 36360

INSTRUMENT CORNER

Q. Reference AR 95-1, paragraph 4-23b. There seems to be a lot of confusion in regards to just when an alternate is required. In paragraph 4-23b, reference is made to the appropriate alternate minima for the aircraft being flown. It also makes reference to RADAR minima not being used to determine alternate criteria. Many believe this is in reference to the standard alternate minimum of 600-2 or 800-2 (or 600-1/800-1 for rotary wing). Therefore, no alternate would be required (other than radar) if destination had 800-1 (for rotary wing). This is such a big difference from the FAR 91.83 and the old AR 95-2 that I believe there has been an oversight somewhere. Please give me your view.

A. AR 95-1, paragraph 4-23b, states in part: "...an alternate airfield is required if the weather condition at the destination is forecast to be less than appropriate alternate minima for the aircraft being flown."

"Appropriate alternate minima" means: standard or nonstandard alternate minima. Standard alternate minima is 800 feet, 2 miles visibility for a nonprecision and 600 feet, 2 miles visibility for a precision approach (DOD FLIP Low Level Instrument Approach Procedures). Nonstandard alternate minima would be the exception to standard as found in the front of DOD FLIP Low Level Instrument Approach Procedures Chart. The forecast weather is for the estimated time of arrival at the destination.

The "aircraft being flown" means either fixed wing aircraft or helicopters—the latter category being authorized to reduce the visibility to 1 mile.

AR 95-1, paragraph 4-23b, also states in part: "Radar minima will not be used to determine alternate minima criteria."

In cases where an IFR flight is planned to a destination airport based on radar minima, 600 feet and 2 miles visibility could not be considered unless the airport also had an ILS approach. Of course, if radar were the sole approach aid an alternate airport would be required regardless of forecast weather.

AR 95-1, paragraph 1-3a states: "Federal Aviation Regulations (FAR) pertaining to flight operations published by the Federal Aviation Administration (FAA) will be complied with while in territory under the jurisdiction of the FAA except as modified herein." The provisions of FAR 91.83, therefore, would not apply to Army aircraft.

Sir:

In reference to the article in the February issue of the DIGEST IFR Operations (page 43), I would like to comment just a little. I was the flight engineer on the aircraft that was mentioned and you can be sure that the statement that was made about not forgetting those 50 seconds or so any time soon is an understatement. I'm not criticizing the pilots and least of all the aircraft, but IFR training cannot be stressed too much. Both pilots were instrument rated and were fine pilots but situations like this occur many times and lots of them don't end up like this. I do believe that more training should be in effect to all pilots for their own good. There was also some mention about outside help. I honestly believe that my prayers were answered that night of 17 December 1969.

Thank you so very much for listening to my views and please urge all pilots, no matter how old or bold they may be, to listen; it's their safety we are all concerned about.

Larry D. Scott
317 Sunset Drive
Mount Airy, NC 27030

Professional Courtesy

AS MEMBERS of the military we often hear the word "courtesy." Exactly what does this word mean to us? Courtesy plays a big part in the tradition of our country and its military forces, and it is as important today as it was when our country came into existence.

Courtesy is basically consideration and respect for others. It can be displayed in many ways: rendering of a salute to superiors or the flag of the United States, using the word "sir" when appropriate, standing retreat, paying last respects to the dead and respect for authority are a few examples.

Army aviation personnel often hear of another type of "professional courtesy." What does this term mean to us? To answer this question best, let's start with a few examples of what it *doesn't* mean:

- Cutting off another aircraft because you had the right of way regardless of the chance of an accident.
- Leaving cigarette butts and candy wrappers all over the cockpit for the next crew.
- Making a radio transmission without monitoring the frequency to see if someone else is talking.
- Cutting another aircraft out of traffic because you are in a big hurry to get to happy hour.
- Wasting time on the active so that the aircraft on final has to go around.
- Not making a writeup on the -13 because it is too much trouble, even though the writeup could prevent an accident.
- Exceeding the limitations of an aircraft and then letting someone else take it on a flight.
- Not turning off a taxi or landing light so that the plane turning final is blinded.
- Not complying with regulations and altitude separation so that other aircraft are endangered.
- Pulling an engine runup without regard for who or what is behind you.
- Forgetting to close out your flight plan so that a ramp check or air search has to be made.
- Calling ready for takeoff and then performing runup procedures on the active while aircraft stack up behind you.
- Pulling pitch on a helicopter just as a fixed wing aircraft is landing or taking off.
- Turning an aircraft so that ground personnel are thoroughly dusted off.
- Hot roding, careless and dangerous operation of an aircraft without regard for other aircraft.
- Fast taxi and careless ground handling operations without regard for other aircraft or ground personnel.

How often have you seen things like those above happen and think to yourself, "what a nut" or "look at that inconsiderate so and so"? Some of these examples are petty, others more serious. All of them—and many others—happen each day. Courtesy in Army aviation is an important and necessary trait.

Professional courtesy means just what it says: being professional aviators in the performance of duties and being courteous to others. The old saying "Do unto others as you would have them do unto you" makes sense. Think before you act, take that little extra time and make that little extra effort. Doing so will pay off in the long run. Everybody's jobs will be easier. Tempers will be cooler and the jobs will be done better.

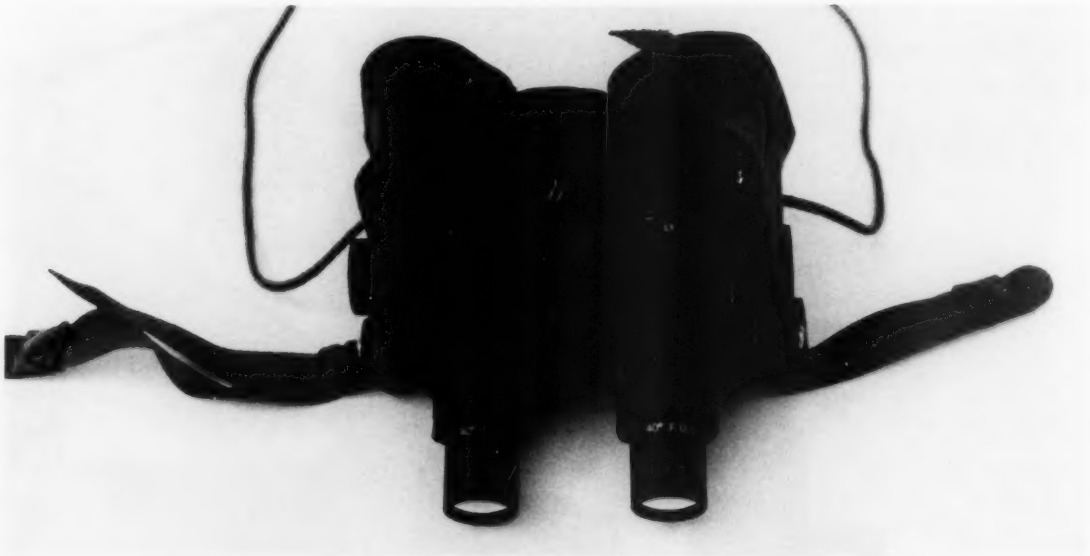
Practicing professional courtesy will keep Army aviation personnel the best "Above The Best."

Captain Terry D. Turner

The Golden Rule
Applies To You . . .

FIRST

How Night Becomes DAY



The author discusses technical data and the practical use/application of the AN/PVS-5 night vision goggles. While the utility of the NVG is amazing, there are some limitations, too, such as the 40-degree field of vision, see photo above

Major Charles D. James

THE NIGHT VISION goggles, AN/PVS-5, is one of the most exciting innovations of the decade. While this sounds like a bold statement, the fact is that the goggles afford the capability of seeing . . . and seeing quite well . . . in darkness, with both hands free. This literally changes night into day and allows virtually every daylight activity to be accomplished at night with equal dexterity.

Since a limited purchase may soon be made, this article is being used as a vehicle to provide some insight into the system, its handling, care and operation.

The goggles, as shown in the pictures in LTC George W. Moses' article ("Helicopter Low Level Night Operations," page 2), may have some minor modifications when they actually reach the field. At this time these appear to be in the head strap, foam cushioning and the switching of the position of the battery with the position of the "OFF-ON-IR" switch.

The system provides night vision using available starlight, moonlight or horizon reflections. An infrared (ir) light source (diode) is located in the center of the lower frame and provides illumination essentially for close viewing or when total darkness exists. In a hostile

environment the ir is electronically detectable. There is no ir emission in the "on" position since passive light is used. The binocular assembly has two monocular units consisting of an objective lens, an image intensifier tube assembly and an eyepiece. The life expectancy of each tube is several years based on a 1 hour per night average usage. These tubes are powered by a 2.7 volt battery about ¾ inch long. Under normal operation in the "on" position this battery will provide 15 to 18 hours of power at room temperatures. When the infrared diode is turned on, this life is reduced to 12 continuous hours.

For arctic or severe temperatures an extension cord is provided in the carrying case so that the battery may be placed in a breast pocket and thus achieve closer to room temperature performance. In some models when the battery becomes weak the wearer receives a signal in the form of intermittent blinking of one or both of the tubes. Several minutes later one of the tubes will cease functioning. Replacing a battery, which may be carried in a pocket as well as the carrying case recess, requires less than a minute. The battery is inserted, recessed end (positive) first, in the battery compartment of the goggles or in the arctic kit battery holder when it is used, making certain that the battery cap is tightened firmly to achieve a watertight seal.

While the goggles have what appears to be a nose bridge, they are actually worn with the upper cushioning next to the hairline. The lower portion of the goggle facepiece is designed to permit a gas mask or oxygen mask to be worn.

In the photographs on these pages of the CAVNAVS (Combat Air Vehicle Navigation and Vision Study) version the side straps are snapped on the helmet by replacing the helmet screws with the provided snaps. The top straps are attached to Velcro patches which are contained in the carrying case for the helmet. In the standard version the strapping is designed for over and around the head, much as a gas mask is secured. A head strap that could apply in either case is being considered.

The U. S. Air Force engages the top front of the goggle housing between the foam and helmet shell to achieve a mechanical lock. A front strap is not used, so the side straps provide a quick release which allows the goggles to fall to the chest suspended by the neck cord. This cord is placed over the head and around the neck to provide a means of carrying the goggles at the "ready" when continuous use is not essential.

The system has numerous individual adjustments. The interpupillary distance or space between the eyes may be adjusted from 55 to 72 millimeters. This is done by loosening the winged nut on the top of the frame, moving the monoculars (tubes) to the appropriate position and then retightening the winged nut. On the sides of the case are knobs for adjustment of the eye inset. There is about ½ inch of travel that can be used by loosening these knobs.

On each tube nearest the frame is a plus 2 to minus 6 diopter adjustment, which is essentially the same as the compensation for each individual eye as is found on standard binoculars. These adjustments provide a means for certain spectacle prescriptions to be incorpo-

The lower portion of the NVG is designed to permit wear of an oxygen mask. Straps will accommodate under, on or over helmet mounting

rated within the goggle. There is, however, no provision to compensate for an astigmatic error. There is a range adjustment on each tube accomplished by turning the ring with the six projections on it. The full range is from 9 inches to infinity and requires about 100 degrees of turn from stop to stop.

The goggles come in a rigid foam-lined storage case which holds a carrying case. The storage case, which is dustproof and humidity sealed, is about twice the size of the carrying case, which is a thicker version of the 7 x 50 binocular case and has a webbed shoulder strap and a tension type front snap. The goggles are placed in the carrying case tubes down, with the nose bridge facing the lid hinges. There are eyepiece caps for both ends of each tube—the larger caps go on that portion of the tubes which extends inside the mask called the eyepiece. These caps must be kept on at all times when the system is not in use to protect the surface of the lens and eyepieces.

A special lens tissue is provided to dry or remove dust. When operating in dusty or sandy areas the wearer should avoid looking directly into the wind since the resultant pitting or scratching will reduce the resolution. Continuous gentle cleaning is a must under these conditions. When operating in rainy or humid conditions there are demisting shields that snap on over the eyepieces. These will be damaged if wiped while wet or with a wet tissue.

All components must be dried after use. A wet system should not be put in the carrying case or the porous foam will absorb the moisture and provide a more receptive surface into which dust may be embedded. In salt water areas the system must be cleaned with fresh water after each exposure. Unsnap the face cushion and head strap assembly and clean them separately. The goggles may require immersing for adequate cleaning and are designed to allow this. They should not be disassembled, but must dry thoroughly.

The system is designed to accept field use and the case life has been estimated at 10 years, provided the users realize that anything with glass in it can't be handled like an entrenching tool.

The goggles are operated by placing the neck cord over the head and adjusting it under the collar for comfort. The battery is inserted and the head strap assembly snapped on the face mask. The eyepiece and objective lens protective caps must be removed and it is best to place them in the carrying case. If the system is issued without the case, put the protective caps in a breast pocket. Holding the goggles in the left hand the face cushion is placed against the forehead, adjusting the position to ensure that the eyepieces are level with the center of the eyes. The right hand then is used to place the head strap over and in back of the head.

For use with the flight helmet, engage the top lip under the helmet shell or attach the straps. Secure the left side of the goggles and adjust the head straps for comfort and stability. The system is turned on by moving the rotary switch at the bottom of the mask one position or one click forward. When the tubes illuminate, the lever clamp winged nut at the top of the frame should be loosened to adjust the interpupillary distance, if necessary. Then the winged nut is retightened. The clamp knobs are loosened and the binocular assembly adjusted until the eyepieces are located a comfortable distance from the eyes. Both clamp knobs then are retightened.

The range knobs turn counterclockwise for distant viewing. The left eye is closed and the right dioptric knob is adjusted for the clearest view. Next, the right eye is closed and the left diopter adjustment completed. There are no clamps to loosen or tighten for these adjustments.

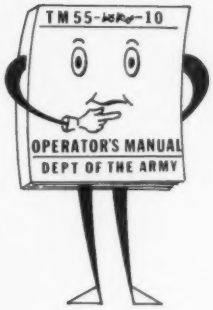
If the ir is turned on it can be detected by passing your hand in front of your face. If the contrast appears extra bright then the ir is operating. Remember, when the ir illuminator is turned "on" the goggles are electronically detectable. Future models of the goggles may have a detent position in the ir switch to prevent inadvertent use.

To deactivate the system the rotary switch is turned to the "off" position and the green glow disappears. The goggles are removed by holding the face mask with one hand and removing the head straps with the other. For storage the battery must be removed and placed in the carrying case. The battery cap must be screwed on firmly whether the battery is in place or not.

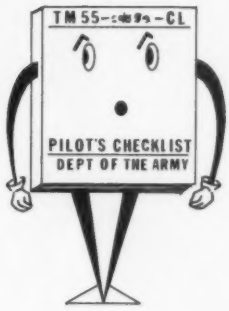
In use, the goggles should provide recognition of personnel at more than 100 meters with comparatively greater ranges for vehicles, based on their sizes. Although appearing in a greenish color, images can be seen relatively well up to about 1,000 meters, depending on various light conditions.

When driving at night there is very little loss in capability from daylight conditions. When flying only a loss in ability to detect wires at comparable speeds exists. Hovering requires a fixed reference and more forward attention due to the reduction of peripheral vision. Getting used to the tunnel vision sensation, the weight, the need for focusing and seeing things in green takes about 6 hours.

The goggles appear certain to be invaluable for preflights, organizational level equipment maintenance in areas of no light source and just about any other application where a need to see in the dark exists.



Charlie and Danny's Write-In



Dear Danny: I would like to point out an error in the U-8F dash 10, TM 55-1510-201-10/5. On page 12-7 the fuel table says that 10 gallons of fuel would weigh 50 pounds and it should read 60 pounds, based on 6 pounds per gallon. Shouldn't this be corrected and how does one go about it?

SP4 C. A. W.

Danny's answer: The correct method of requesting changes to the dash 10 or checklist, using DA Form 2028, appears in subject manual, page 1-2, paragraph 1-15.

Instructions for preparing DA Form 2028 can be found in paragraph 1-8, c and d of AR 310-3 dated December 1968, w/change 6. In other dash 10 manuals instructions for submitting changes or reporting corrections can be found in chapter 1.

A DA Form 2028 will be submitted to the U. S. Army Aviation Systems Command in your behalf to make the correction you reported. If approved it will appear in a printed change at a later date. Feel free at any time to submit any suggestions you might have to improve your manuals or to correct any misinformation that may have been overlooked.

Dear Danny: I recently noticed a small error between information contained in the UH-1D/H dash 20 and the dash 10 in regard to the "RPM high-low limit warning system." There is a discrepancy between the books as to when the high warning lights came on. Please advise which is correct.

CPT P.C.W.

Danny's answer: You are entirely correct, a very small error does exist in the dash 10 manual, paragraph 2-34g(3). In addition there is another error in the same paragraph which you did not notice.

Those in-the-know contend item (3) should read as in the box below.

Warning Light Only	**For rotor RPM of 334 (plus or minus 5). (High warning)**
Warning Light and Audio Warning Signal in Confirmation	**For rotor RPM of 300 (plus or minus 5), or engine RPM of 6100 (plus or minus 100), or both. (Low warning)**

Thanks for your continued interest, captain. Your comments and recommendations are always accurate and timely. Keep 'em coming.

Dear Danny: My comments concern TM 55-1510-204-10/4, OV-1C Operator's Manual.

Paragraph 3-43, item 30, calls for the pilot's oxygen equipment check and item 46 calls for the observer's oxygen equipment check, but you have to turn to chapter 5, paragraph 6-110, to find out how the check is performed. May I suggest rewriting paragraph 6-110, relocate it in chapter 3 where it belongs, and include a step to check the emergency position of the flow switch.

I feel the above suggestions will help improve this manual.

MAJ D. J. M.

Danny's answer: Your suggestion is well taken, major, and we will follow up by submitting the necessary paperwork to accomplish your request. For your information a request has already been submitted to update section V of chapter 6 to some degree; your suggestion will further improve this section.

SUPERSALESMEN FOR SAFETY

IF SOMEONE WERE to offer you a new car—free—would you accept it? You bet you would—like a hungry bass striking out after a plump shiner. Now, instead of a new car, suppose someone were to offer you your life. Would you accept it with equal abandon? Don't be too hasty with your reply. During FY 1972, approximately 56 Army aviators turned down that offer and lost their lives. These unfortunates were part of a group of aviators unwittingly involved in more than 240 accidents that took the lives of 200 additional occupants and caused the destruction of 91 aircraft at an estimated cost of more than $35 million. And keep in mind, this was the year Army aviation established the best safety record in its history.

Granted, some accidents appear to be unavoidable —a seemingly solid rotorhead separates from a heli-

Ted Kontos
Directorate for Education and Prevention
USAAAVS

copter; a properly maintained engine suddenly fails during a night flight over mountainous terrain . . . Then there are those accidents which result from another individual's actions beyond the control of the aviator: A trunnion support bracket cracks and fails because of an overtorqued bolt; a short shaft fails because it was installed backwards; a transmission fails because of loss of lubricant past an improperly installed oil filter gasket . . .

While only a small percentage of all accidents result from causes such as these, the accidents that do occur are sometimes catastrophic. Obviously, there must be no let-up in the amount and quality of training and supervision needed to prevent accidents from similar causes. However, the accidents referred to in which a combined total of approximately 256 aviators and other occupants were killed during FY 1972 *all* involved crew-associated cause factors—particularly pilot error—and represent approximately 70 percent of all Army aircraft accidents that occurred during that year. Clearly, pilot error of some type remains the greatest *single* accident cause factor. Further, most pilot errors do not result from lack of skill or training, but from the pilot's willful commission or omission of some act or procedure contrary to what he has been taught, against his better judgment, and usually, in violation of regulations and SOPs.

In one instance, a pilot attempted a chandelle at low level over a populated beach. The aircraft stalled and crashed. In another instance, a helicopter struck wires and crashed. The pilot was performing an unauthorized low level flight and had not made any prior reconnaissance. Another helicopter crashed into a heavily populated area of a major city after the engine failed. The pilot of this aircraft had deviated from the established route and was performing low level flight over the city when the fuel quick-disconnect coupling came loose. He had also failed to complete a thorough preflight inspection.

During a night mercy mission conducted in a blizzard to airlift a patient from an isolated area to a hospital, the pilot encountered such severe winds and blowing snow that only with great difficulty was he able to land his helicopter and abort the mission. Yet, a few minutes later, with the same adverse weather conditions prevailing, he elected to continue his mission and resumed flight. Shortly afterwards, the aircraft crashed. The patient recovered, but was evacuated by other means.

Another pilot and a passenger took off in a light aircraft on a night flight into known adverse weather. Severe thunderstorms, hail and tornadic winds had been forecast. Shortly after takeoff, the aircraft crashed.

Another fixed wing aircraft crashed during a forced landing attempt, following fuel exhaustion.

While these examples represent only a few of the types of accidents that result from pilot-associated cause factors, the cause factors themselves appear in accident after accident every year—violation of regulations, failure to perform a thorough preflight inspection or cockpit check, false sense of urgency to complete a mission, exceeding personal limitations or those of the aircraft, failure to plan and conduct flight properly . . . There are others, of course, but the important point is that in each of these accidents, the individual aviator was in charge of making the decision. It was up to him to decide what he would or would not do. Further, he was the one person who best knew his limitations and capabilities.

What induced each individual to act as he did? What made him decide on a course of action that inevitably led to his accident? We will never be able to answer these questions with absolute certainty. With one exception, there were no survivors in the examples cited.

At best, then, we can only speculate as to what may have been the driving force that influenced each pilot in making his decision. We know, for example, that the pilot involved in the mercy flight was highly experienced and qualified in his aircraft. He also had a powerful motive—that of aiding a human in distress. Maybe he felt that he could cope with the elements, and that the very nature of his mission demanded that he try.

We also know that the pilot who deliberately at-

tempted flight through severe thunderstorms was flying a borrowed aircraft which he had agreed to return by a given time. But was this ample motive for attempting a mission that was virtually impossible to complete? Again, we will never know for certain.

But while we can't answer these questions, we do know what can prevent accidents from similar causes: *an effective aviation safety program.* And we have just such a program. Any program which can muster the support necessary to reduce the accident rate to 11.95 accidents per 100,000 hours of flight as this one did in FY 1972, when Army aviation established the best safety record in its history, certainly is an effective program. Why, then, do accidents such as these continue to occur? Because all aviators are not fully sold on the program. It's as simple as that.

As previously stated, approximately 70 percent of all accidents which occurred during FY 1972 involved one or more crew-associated cause factors. While this does not mean that 70 percent of all crewmembers failed to "buy" into the safety program, it does mean that some failed to "buy" 100 percent into the program. Had they done so, few, if any, of these accidents would have occurred.

Where, then, does the problem lie? With the individual, or with our method of "selling" safety? Let's take a look at our safety program, keeping the *pilot* in mind. To begin with, we have commanders at every level of command. While each has certain specific areas of responsibility, collectively they function as managers of the safety program. They study problem areas, determine needs and initiate cures. They establish policy, issue directives, ensure adequate training, provide necessary equipment and promote safety by various means. This promotional work—let's call it advertising—is accomplished through a number of media. These include weekly, monthly, quarterly and annual safety publications, posters, films, tapes, closed circuit television and special studies, reports and pamphlets as well as briefings of various types. Finally, we employ professional salesmen to complete the job. These individuals serve as a direct contact with the aviators and are specialists in their fields. Among them we find the safety officer, ground school instructor, IP, flight surgeon, operations officer, etc.

The method used to merchandise our safety program is basically no different from that used by the largest and most successful business firms whose very existence depends upon their ability to sell their goods. But the most important comparison lies in the results obtained. While we have not been able to sell all Army aviators 100 percent on our safety program, neither have our counterparts in business been able to sell every potential customer their products. The significance of this comparison lies in "why" every person cannot be sold a particular item.

Regardless of his skill, every professional salesman knows that before he can make a sale, his prospective customer must satisfy four major requirements. Failure to qualify on one or more of these points will invariably result in "no sale." Since his livelihood and the future success of his company are at stake, the professional salesman will mentally qualify his prospect on the following points before he expends valuable time and effort:

1. Does he need my product?

If you happen to operate a marineland, you may possibly be in the market for an 80-ton whale, but try selling one to the average man on the street—at any price. Safety, on the other hand, is absolutely essential to everyone. To the Army aviator, it means his personal health, the health of others, the conservation of vital resources, and the enhancement of the Army's combat capability—its primary mission. Every Army aviator unequivocally meets the first requirement.

2. Can he afford my product?

Obviously, no matter how beneficial a product may be or how great the need and desire for it, if an individual cannot somehow raise the required capital, he cannot buy it. Yet, safety costs the aviator nothing. It is handed to him. This includes all research, the development of new products and the improvement of old ones. It includes all the supporting facilities, training, equipment and tools. Safety not only doesn't cost the aviator anything, it pays him immeasurable dividends. Every aviator meets this qualification.

3. Will he listen to what I have to say and examine what I have to offer?

If an individual can't be reached, he cannot be informed about a product, its benefits or its source of availability. The Army aviator has been nurtured on safety from the day he began flight training. He knows all about the product and its benefits as well as how to obtain it. This brings us to the final point.

4. Is my prospect openminded? If I can show him the advantages of my product, point out his need for it, and show him the benefits he can derive from it, will he be willing to buy it?

Would you go to your doctor with a preconceived notion that no matter what his diagnosis might be, you would staunchly refuse to follow any diet he might recommend, take any medication he might prescribe or alter your way of life in any way he might deem beneficial? Certainly not. If you felt that way, there would be no point in your going to him.

Unlikely as it may seem, this kind of dogmatic attitude concerning the safety program does exist in Army aviation—but fortunately, only to a small degree. And its existence is understandable. While the safety program is a single product, it consists of an almost infinite number of individual segments.

Consider, briefly, the pilot. He is a trained aviator, a meteorologist, a navigator, a communications expert, engineer, mechanic and inspector. He must not only stay proficient in all these areas but must continually expand his knowledge in others. He must qualify in different types of aircraft, maintain instrument proficiency and learn new procedures as well as how to use new equipment. He must be a physical fitness expert and a nutritionist to stay fit. He must also hold down a full-time job that is not necessarily related to flying. Add to this the myriad of regulations that he must know and obey, and which are so necessary for safety, and we can readily see how easy it becomes for him to attach special significance to some areas of the safety program while relegating others to a relatively minor role of importance.

A pilot might never attempt a takeoff after he has noted a low oil pressure indication, or after he has discovered excessive magneto drop; but he may very well be tempted to continue a takeoff roll—as one U-8 pilot did—with the gear warning horn sounding, thinking the cause to probably be an improperly adjusted switch. The results in this instance were a premature retraction of the gear and major damage to the aircraft.

Similarly, a pilot might never be guilty of buzzing a residential area, but he might not hesitate to skim above treetops to break the monotony of a solo cross-country flight. Sometimes he ends up breaking more than just the monotony.

In extreme instances, a pilot may completely disregard the importance of vital portions of the safety program. One such case involved an aviator whose aircraft struck wires while he was performing an unauthorized low level flight in violation of regulations and his unit's SOP. When asked whether or not he might repeat these actions during some subsequent flight, he replied to the effect that regulations and SOPs did not mean much to him, and if he decided to, he would disregard them anytime he chose to do so. Fortunately, this kind of attitude is not a prevalent one. However, there are far too many instances in which deviation from some prescribed safety practice has resulted in mishaps.

Well, if an individual is dogmatic concerning the importance of some portion of the safety program, and if professional salesmen give up when a prospect fails to meet this qualification, what can we do to get through to this individual and force a sale?

Plenty! First of all, a professional salesman doesn't give up; he simply refuses to waste valuable time until his prospect can meet all four qualification points. Meanwhile, he maintains contact and an open line of communication with him. In Army aviation, we also do this; but we can go a step further, and by doing so, we can close that sale and eventually get 100 percent of the aviators to participate 100 percent in the safety program. And we can accomplish this seemingly Herculean feat with surprising ease. If we can't do the job with professional salesmen, then let us turn to a special kind of salesman who can get through to an individual and make that sale. Preposterous? Not at all. In fact, we can begin right now—by mustering these "supersalesmen" within our ranks and enticing them to do the job that only they can do.

Where do we find these individuals with superhuman powers? They abound in all areas of Army aviation, and they are in your unit. Once they decide to accept the challenge, they will begin the job by first backing the safety program 100 percent. Actually, that's really all they have to do. Everything else will then fall into place.

As to locating these supersalesmen, that isn't difficult either. As a matter of fact, each of us knows of at least one such individual. We greet him every morning when we shave, and we encounter him numerous times throughout the day—every time we comb our hair, adjust our tie or wash our hands.

The next time you meet this individual, pause a moment and study him carefully. He bears no distinctive characteristics that identify him as being specially endowed with powers of persuasion. But make no mistake about it, he is the man—the only man—who can stop accidents and other mishaps that result from pilot-associated cause factors!

LOOK OUT BELOW!

Major Carl S. Gerhard
Directorate for Aircraft Accident Analysis and Investigation
USAAAVS

FROM HIGH to low, look out below!

We all know what that means. When flying from a high pressure area into an area of lower pressure, you're actually flying lower than the altimeter indicates. The same "look out" warning applies whenever you are landing, taking off, and especially when flying low level—among the trees and wires. Now, one would think that a pilot would need a good reason for flying, or attempting to fly, over and around these natural and man-made obstacles. Unfortunately, that is not always the case. One aviator ran into wires while flying low level to recon a river for a "float trip"; another, while flying low over a reservoir "just for kicks"; and another, while flying low level through a valley. And so it goes. During takeoffs and landings, numerous pilots have struck wires even when they *knew* wires were in the area.

One such case occurred recently. An aviator with over 1,900 hours flight time was given the mission to fly an inspection team to various sites. On the second day of the mission, he arrived at the airfield an hour before takeoff, preflighted the OH-6, briefed his passengers and, in turn, was briefed by the operations officer, who specifically informed him of cables in the vicinity of one of the landing sites. The pilot acknowledged this and reminded the operations officer that he had recently flown into that area.

The cables in question consisted of two sets of lines approximately 300 feet above the valley floor, with one set 50 to 60 feet above the other.

When they arrived over their destination, the pilot made a high reconnaissance by circling twice in a left-hand orbit (he was in the right seat), then entered a left-hand traffic pattern and began a long final through the valley. According to witnesses, the aircraft continued to descend to approximately 250 to 300 feet above ground level. Suddenly, it began to climb, then struck the top set of wires with the rotor system, disintegrated and fell to the ground.

There was, of course, an investigation and the board determined *what* happened. But they couldn't find out *why*. Did the pilot forget about the wires? Did he fail to see them on his recon? Did he try to fly over or under them? No one knows.

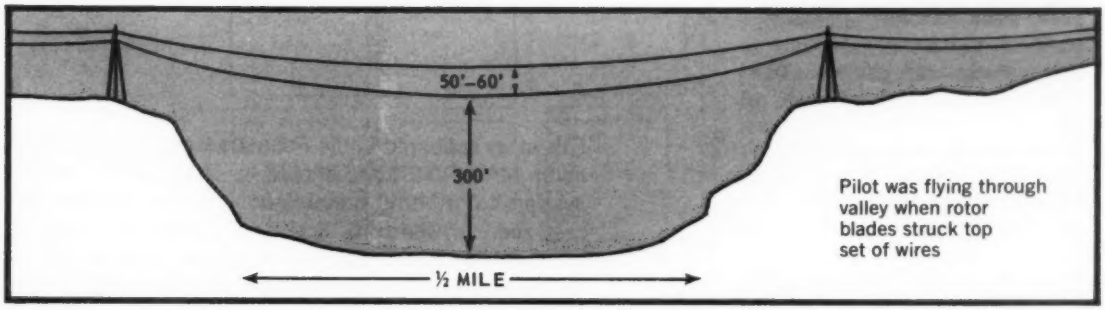
During the last two fiscal years, 70 wire strikes have killed 17 people and destroyed 19 aircraft at a cost of over $2 million. More than one-half of these wire strikes occurred during low-level flight (as opposed to takeoffs, landings or hover), and most of these accidents were caused by pilots who were flying low level in violation of regulations or directives.

The landing phase was the next most prevalent operation in which wire strikes occurred. The primary cause during this phase was inadequate reconnaissance of the landing area—failure to see the obstacle.

Although the number of flying hours is generally being reduced throughout the Army, these low-level type mishaps are likely to continue if pilots and commanders do not plan ahead. The Army is participating in new programs and performing additional training which will require landing in strange, unprepared areas and deliberately flying near trees and wires. Two such programs are MAST (Military Assistance to Safety and Traffic) and NOE (nap-of-the-earth) training.

The MAST program supplements existing emergency medical facilities in a community by providing air ambulance service when emergencies arise. Military helicopters stocked with necessary medical equipment and supplies are maintained in a constant state of readiness and crews are kept on alert for immediate response to requests for help.

During the initial phase of the program, July 1970 to October 1971, MAST units flew 681 missions, bringing 881 persons to hospitals or performing



emergency transfer of patients. During a recent holiday weekend, one MAST unit responded to five emergency calls. One involved a highway accident and the others required evacuation of a burn victim and three patients with critical internal injuries from rural area hospitals to larger hospitals where they could receive specialized treatment.

The crew normally consists of two pilots, a crewchief and an aidman. Although most missions are to transfer patients from one hospital to another, crews must often evacuate casualties from accident sites. This means making flights day or night into unfamiliar pickup zones which will often abound with numerous wires and other obstacles. These missions are no less demanding than medevac missions flown in Vietnam.

The other program, which is receiving a high priority, is NOE training. The Department of the Army has stated that "recent Vietnam combat experience and aircraft survivability test results have revalidated Army doctrine concerning nap-of-the-earth flight as a means of enhancing aircraft survivability in mid-intensity combat environments." NOE flight is flight as close to the earth's surface as vegetation and obstacles permit, using the contours of the earth and all available cover and concealment. In this case, the primary hazards are quite obvious —trees and wires. We all know they are there, yet we *must* fly among them. How do we do this safely?

The U. S. Army Aviation School (USAAVNS) at Ft. Rucker, AL, is presently preparing a training circular which will serve as a guide for establishing a successful NOE training program. Incorporating lessons learned from NOE training conducted by the U. S. Army Combat Development Experimentation Command (CDEC) and Ft. Rucker, it will establish general guidelines for selecting training courses, and will prescribe the training necessary for both initial and annual qualification of the individual aviator. The goal of this training is to develop and maintain individual aviator and aviation unit capability to perform effectively in mid- to high-intensity warfare.

To perform new missions, such as MAST and NOE, which have known hazards, additional education and training programs are necessary. In the case of MAST, training must embody continuous day and night orientation flights throughout the area of operations, including practice landings at all regular heliports. Crews must learn to communicate with each other in a standardized manner so that there will be no doubt as to what is stated or requested.

To conduct NOE training safely, close supervision is a must. This supervision must include aircraft selection, conductance of ground school and that of actual flight training. Further, aircraft should be equipped with crashworthy fuel systems and a complete working avionics package, and have clean, scratch-free windshields. Ground school must include training in hazard recognition, thorough flight planning to include performance data (e.g., at what gross weight the aircraft can hover out of ground effect) and sufficient mapreading to ensure that navigators are able to interpret a map in relation to the actual terrain. All NOE flights must be supervised to monitor use of terrain, navigational ability and proper air speed for existing conditions.

These programs are now a part of Army aviation and must be performed in the most efficient manner possible. Although such missions are potentially more hazardous than the "average," they can be accomplished safely with proper training and supervision of personnel.

RBS--- Plan B For Weather Forecast Service

Major Bob Gardner, USAF

Captain Phil Budd, USAF

This story appeared in the February issue of the U. S. Air Force MAC FLYER and should be of assistance to Army aviators for a better understanding of the weather forecast service. Charts 5, 8, 9 and 10 are not published but are referenced because they are used in the Air Weather Service's Standardized Pilot Briefing Display

HAVE YOU NOTICED any changes in the services provided by your local base weather station lately? Have you called pilot to forecaster and found that there was only an observer on duty? On your last flight, did you have to study the weather charts without the aid of a forecaster and then receive your 175-1 briefing over the telephone?

You probably have experienced one of these situations in the last few months and should expect more because of a major Defense-directed cutback in Air Weather Service people and services. Service to aircrews was directly affected by this people cut, since about a thousand are base weather station forecasters and observers. Because of the people losses, many weather detachments no longer operate full time. Though they probably have observers round the clock, forecasters are on duty only 16 to 18 hours each day.

The Concept

To cope with this drawdown and still provide adequate support to flight crews, the troops at HQ AWS came up with three possible alternatives. First, they could do away with all formal briefings during the hours when no forecaster was on duty. It would be up to the pilot to brief himself from weather depiction charts—if the weather looked good, he would just press on. If he felt he needed additional help, he could call a forecaster at the closest base having 24-hour service. This put sole responsibility on the pilot for obtaining weather information.

The second alternative was for AWS to establish a central briefing facility at Air Force Global Weather Central (AFGWC) at Offutt AFB [Omaha, NB]. This single facility would handle all 175-1 briefings for all CONUS base weather stations during the hours these stations were closed. A standard briefing display of weather charts would be maintained at the base shop by an observer, duplicating the display at AFGWC. The briefing could then be conducted over the telephone while both pilot and forecaster looked at the same charts. The briefing charts selected were the ones most frequently referred to in a face-to-face briefing. [Display of mid- and high-level winds is optional if not frequently used, as would be the case with Army support units (see figure 1). Standardized pilot briefing display is not maintained at satellite stations unless an observer is on duty in the base weather station during the hours of reduced forecaster manning.] The upper wind charts were provided so that the pilot could obtain high-altitude flight planning winds before contacting the forecaster.

The third alternative was very similar to the second: It was the Regional Briefing Station (RBS)—satellite concept. A regional 24-hour weather station would be responsible for supporting near-by stations (satellites) during periods of closure. A standardized briefing display board would be maintained at both the satellite and the RBS station. The pilot would study the

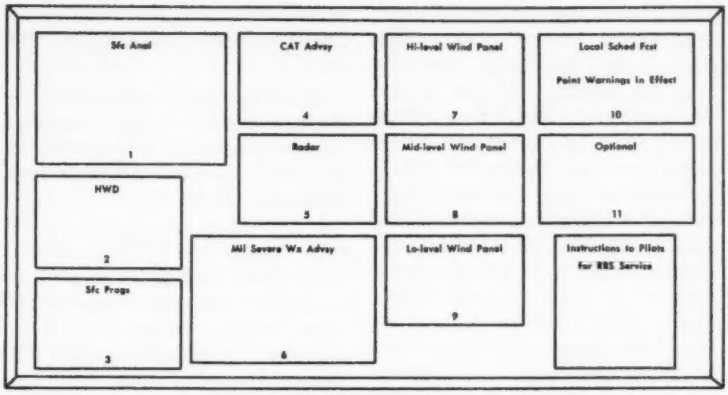


Figure 1: Standardized Pilot Briefing Display

standardized briefing display to get a general outlook of the weather and then do his preflight planning. He would then call the RBS by AUTOVON, on a phone reserved for this purpose only, and receive his 175-1 briefing.

As AWS researched these three alternatives, they came up with the big question: Do we really need a 175-1 briefing? To answer this question, they surveyed pilots at 15 bases. At these bases all types of aircraft and all age groups of pilots were represented. The pilots were asked to fill out a survey form after they had received a normal 175-1 briefing. The survey asked questions such as: Do you ever use this form again in flight? Do you think it is necessary to have a face-to-face briefing? Did the briefing you just received aid in making decisions concerning this flight? Would you obtain a weather briefing if it was not required by regulation? From the responses received, AWS determined that yes, pilots did want to receive a briefing, but that it probably was not necessary for it to be face-to-face. And yes, the majority of them did refer to the 175-1 in flight.

With these three alternatives in front of them and knowing that pilots did want a 175-1 briefing, AWS staffers went to work to eliminate two of the three methods.

For safety reasons the first alternative (no briefing—no 175-1) was discarded. The second one, a central briefing section at AFGWC, was discarded because of the additional manning that would be required and the cost of setting it up. The third alternative, the regional briefing station, was chosen for several reasons. First, the satellite bases must be near the RBS. (Note: See a partial list of RBS and satellite stations in figure 2. Also see the IFR Supplement for hours of operation of satellite stations.) The RBS would now have a vested interest in the weather at the satellite because the same pattern would or could affect the RBS. Many of the RBS sites could also provide radar coverage for the satellite bases and possibly could monitor the satellite station's PFSV frequency. The most important reason for choosing the RBS concept, though, was that it could be implemented almost immediately without an increase in personnel at the regional sites.

This is briefly the history of the RBS concept. What is important now is how is the system going to affect us as crewmembers. To give an example let's play show and tell. Follow us now on a magical mystical tour of a vacant base weather shop.

To help us find out how the system really works—and to help us write this feature—we went down to the weather station at Scott [AFB, Bellville, IL, headquarters for Air Weather Service (AWS) and the Military Airlift Command (MAC)] (we are a satellite station of Blytheville AFB [Blytheville, AR] from 1800 local to 0100 local) and planned a flight to the east coast. There were several things that we found out from our visit to the base weather counter after the forecaster had gone home for the night. First, we had an eerie feeling standing in front of a bare counter with the walls covered

Figure 2: Regional Briefing Stations and Satellites

RBS	Satellite (reduced forecaster service)
Westover	Otis
McGuire	Dover
Langley	Shaw, Myrtle Beach
Seymour Johnson	Pope
Robins	Charleston, Maxwell
Eglin	Hurlburt, Tyndall
MacDill	Homestead
Barksdale	England
Blytheville	Little Rock, Columbus, Scott
Randolph	Bergstrom
Altus	Sheppard, Tinker, Cannon
Carswell	Ft Wolters, Gray AAF
McConnell	Richards-Gebaur, Forbes
Luke (SAGE)	Luke (BWS), Kirtland, Holloman
Hill	Mountain Home
March	Norton, George, Nellis
Beale	McClellan, Hamilton
McChord (SAGE)	McChord (BWS)

with fascimile charts and only the repetitious ratte-tat-tat of the teletype breaking the silence. Also, we wished that those meteorological symbols, teletype weather sequence codes, and hieroglyphics used to depict weather phenomenon, which we last reviewed in pilot training, were a little more familiar.

We studied the standardized display board, got our preflight winds from the upper wind chart for flight planning, filled out our Forms 70 [Form 70 is similar to DA Form 2283, Army Aviation Instrument Flight Log] and 175, and then called Blytheville on AUTOVON (via special speaker phone, supplied so that the entire crew can hear the briefing) to talk to the forecaster and complete our 175-1 [the special speaker phone is not provided at all locations]. While our early-evening call went right through, we found out we were just plain lucky. You can expect anywhere from 10 to 30 minutes delay because of other satellite bases calling your RBS or because of other operational demands. Remember flight crews calling in are number six in the weatherman's list of priorities, and many bases have heavy activity until late in the evening.

To help smooth your first encounter with a similar situation, and to assist and help familiarize you with the RBS procedures, we offer this checklist.

Chart 1: Surface Analysis

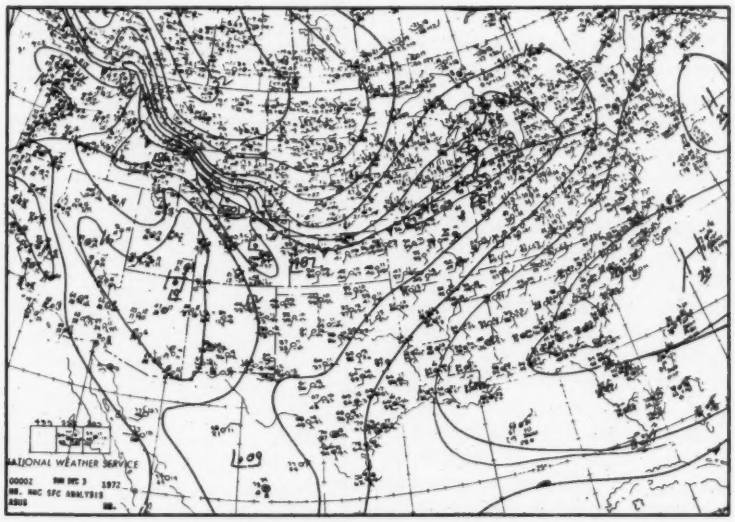
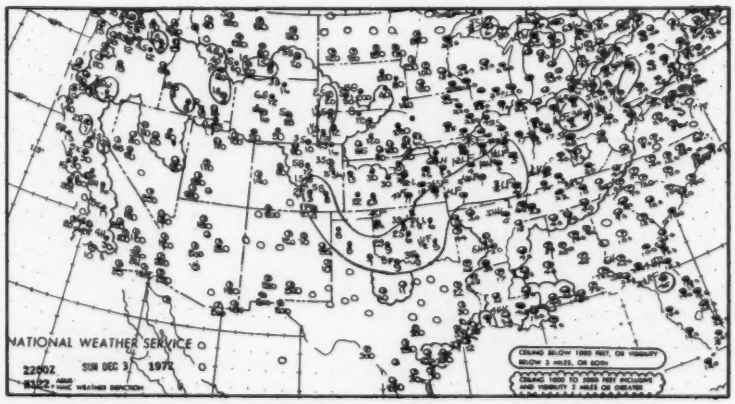


Chart 2: Horizontal Weather Depiction



The Checklist

1. **Look and read.** If you are unfamiliar with the standardized pilot briefing display or if the weather station facilities are a little foreign to you, stop and look around the room. The first thing to catch your eye should be an eight-by-four foot bordered area containing some 10 charts and a set of instructions on how to obtain RBS service. For orientation, go ahead and read the instructions, then take a look at the charts and local scheduled forecast.

2. **Scan and plan.** Now that you've an idea of what's available and where it's located, you can start obtaining enough info to flight plan without contacting the forecaster. In your data gathering, read the last teletype report for your destination and alternate weather. (Note FLIP Planning, Section II, Meterological Data, gives a key to teletype weather reports.) A glance at the local dissemination device will give you the latest local surface observation.

From the winds aloft panels (charts 7, 8, or 9) you can see what the last observed winds are for your proposed altitude. (Remember, those winds are true, not magnetic.) Areas of severe weather are plotted on chart 6, Military Weather Advisory, and hazards such as icing, turbulence, and over-water thunderstorms are portrayed on chart 4. [Chart 4 applies generally to high altitude flights and the requirement to display this chart has been waived for several Army support units.] Now go flight plan, because by this time you are weather-wise enough to select your

route, destination, and alternate, and to figure ETD, ETE, and ETE to alternate.

3. **Fill a few squares.** The next thing we suggest is to get a blank Flight Weather Briefing form, DD Form 175-1, and look it over so you'll be familiar with the blocks. Go ahead and fill in parts I and II, the mission and takeoff data sections. The surface observation and local forecast board will have the info for this.

4. **Make the call.** You are now ready to call the regional forecaster so read and heed the instructions for operating the phone. It may be an external speaker-phone, with special on-off volume settings. Also be prepared to furnish the RBS forecaster these items: (1) your name, (2) aircraft identification and type, (3) departure point, destination, and alternate, (4) VFR or IFR and proposed altitude, (5) ETD, ETE, and ETE to alternate, (6) route, (7) en route stops (in order, with ETAs).

5. **Listen, log, and ask.** From here on the procedure is like any other weather briefing; the forecaster will give you the figures for each block of the 175-1. The only thing different is that you will be writing in the figures instead of having the forecaster do it. You should get the same information and ask the same questions as if the forecaster were standing across the counter from you. In our case, our forecaster described the general weather conditions at departure, en route, destination, and alternate, referring constantly to the charts on the standard pilot briefing display. Don't forget you can and should ask questions throughout the briefing.

What we've described is a normal self-briefing sequence. However, there's no reason you can't call the forecaster whenever you want. Let us make it clear that if you have any questions or special requirements prior to flight planning, go ahead and call the RBS forecaster.

The Charts

There is a vast amount of information available on the various charts in the pilot's briefing display. Without going into a prolonged course in meteorology, we would like to briefly explain this display. Charts 1, 2, 5, 7, 8, and 9 present actual observed data, while charts 3, 4, and 6 offer forecast conditions.

Chart 1 is the surface analysis and it shows the general weather patterns or major weather systems. The centers of high and low pressure areas and the fronts are depicted.

From chart 2, the horizontal weather depiction, you can get the ceiling and visibility conditions. When ceilings are below 1,000 feet or visibility is below 3 miles, or both, the area is surrounded by a smooth line. Where ceilings are between 1,000 and 5,000 feet and visibility is 3 miles or greater the areas are enclosed by scalloped lines.

The surface progs displayed as chart 3 show significant surface weather which has been forecast and include depictions of ceilings, visibilities, freezing levels, fronts

Chart 3: Surface Progs

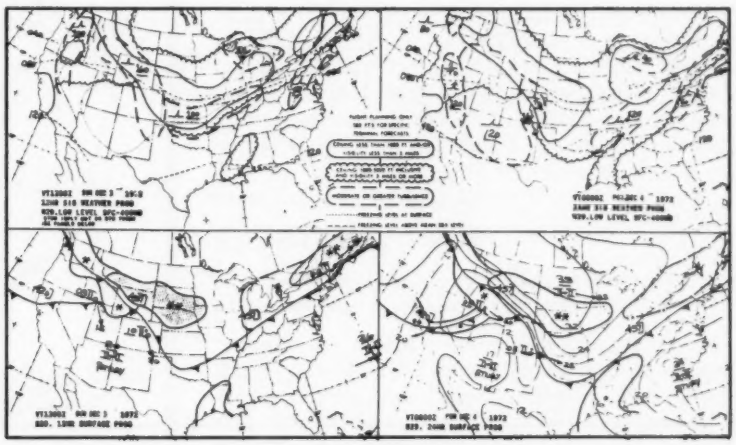
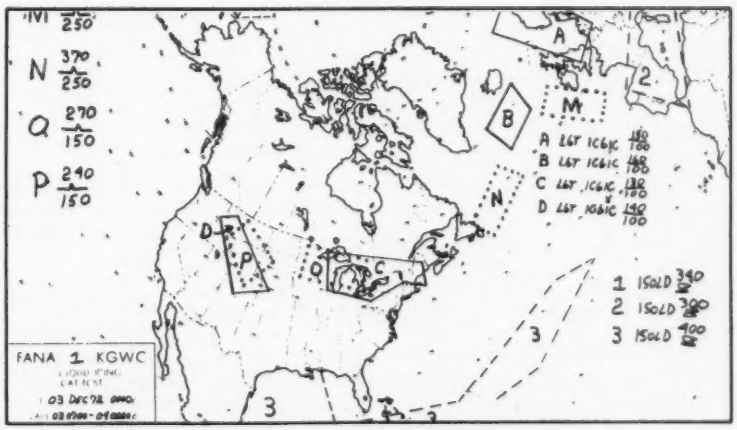


Chart 4: CAT Advisory

Chart 5 omitted



and areas of precip for the next 12- and 24-hour periods.

Radar summaries in chart 5 show the latest observed convective cloud conditions as reported by national weather radar facilities. These include: USAF, Navy, and NWS weather radar reports.

Information on charts 4 (clouds, icing, and CAT), 7, 8, and 9 (winds aloft) was discussed earlier in the text. Chart 10 will provide the 24-hour local area forecast and any weather warnings for the local area. One display space, number 11, is reserved for an optional chart or listing and displays information needed to meet local operational requirements. Optional data include:

1. Astronomical/Climatological Tables
2. RBS/PFSV/EWAS facilities
3. Low level bombing route forecasts
4. Primary alternate forecasts
5. Range/drop-zone forecasts

The Commercial

Well, that's the big picture of the RBS concept of operation. Because of the AWS drawdown, it's up to us to make the most from the information which is presented. Remember, it's not a total self-brief program, and we should ask the RBS forecaster or local observer for any assistance necessary. We must make sure that we get the weather service we need for a safe flying operation.

Since the new program puts more demands on flight crews, we all will need to brush up on the symbols and charts [check TM 1-300, Meteorology for Army Aviation] and allow some additional time for flight planning. Or maybe we can schedule our flight-planning during the hours when our local forecasters are available. The FLIP IFR Supplement gives the hours forecasting service and PFSV are available; check the individual airfield listing. Also, in the back of the Supplement is a list of the facilities where you may obtain weather briefings if instructions on forecasting services are not available locally.

AWS and the local base weather stations are doing all they can to continue to provide you the best possible weather support with their remaining resources. Though there will be unavoidable delays and some inconvenience, they ask your cooperation and understanding. If you have any complaints or criticisms with the RBS concept or service, don't take them out on the guy in the field who is striving to do the best with limited resources of which he has no control. Instead, your system problems should be documented and addressed through your host command operational channels. Or if the system is okay but you are not satisfied with the actual weather service, then document your complaints and submit them to AWS or write a hazard report.

More with less is the name of the game—any weatherman and aircrews both may feel the crunch. But the well prepared troops will still get the info they need—and won't get caught with their drawdowns down.

Chart 6: Military Severe Weather Advisory

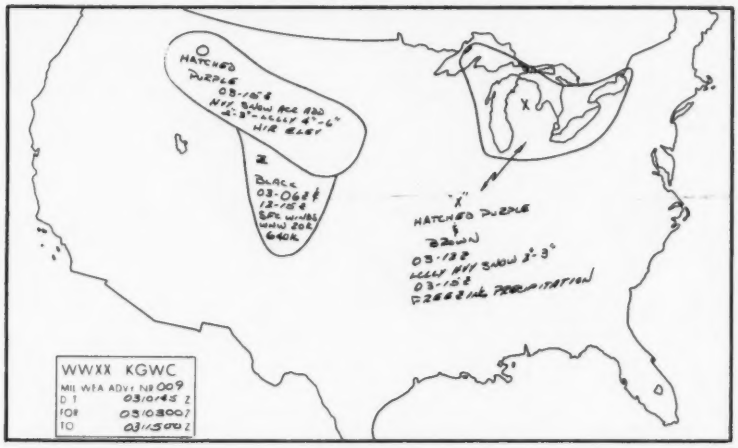
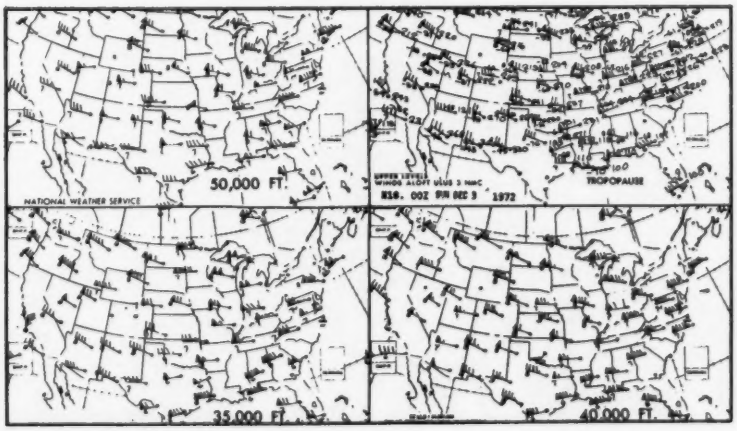


Chart 7: Hi-level Wind Panel

Charts 8, 9 and 10 omitted



If you have a question concerning aviation accident prevention, write to Commander, USAAAVS ATTN: Orval Right Fort Rucker, AL 36360

Crashworthy Fuel Systems

How many major accidents occurred during FY 72 involving UH-1s equipped with crashworthy fuel systems? Were there any thermal fatalities or injuries in these accidents?—Aviator

The "good news" is that there were no thermal injuries or fatalities in the 56 major accidents during FY 72 or in the 10 major accidents during the first of FY 73 which involved UH-1s equipped with crashworthy fuel cells.

USAAAVS AAPC

How do I go about applying for the USAAAVS Aviation Accident Prevention Course?—Aviator

Active duty and USAR officers and warrant officers submit a request for the course to their commander for approval. The approved request is forwarded through channels to the major command for quota allocations. ARNG requests are submitted through the unit commander, through channels to the state Adjutant General. National Guard Bureau allocates quotas to the states.

ASO Course

I understand there's an Aviation Safety Officer Course at the University of Southern California. How do I apply for it?—Aviator

Active duty officers and warrant officers submit a request through command channels to the individual's branch at DA. Branches (including WO Branch) are allocated quotas by the Officer Personnel Directorate, Military Personnel Center. USAR requests are submitted through USAR channels to Continental Army Command (CONARC). Quotas are controlled by CONARC. ARNG requests are submitted through channels to the state Adjutant General. Quotas are controlled by National Guard Bureau.

Aviation Safety Posters

Where can I get aviation safety posters pertaining to the mission type aircraft in my unit?—ASO

According to AR 95-5, each command level has the responsibility for establishing a formal aviation safety program, one facet of which is safety education. Posters are a valid medium in the education field, and all levels of command may develop their own posters with their own resources to fit their peculiar mission requirements. USAAAVS manages the aviation safety poster program at DA level, but this does not preclude development of safety posters by the various levels of command. To obtain DA aviation safety posters, submit a DA Form 12-4 in accordance with instructions on the form. You will find additional details on how to get posters and other publications in the March 1973 AVIATION DIGEST and *Flightfax*, 12-18 January 1973.

Crosswind Component Data

Where can I find a crosswind component chart for all U. S. Army aircraft?—Aviator

No comprehensive crosswind chart for Army aircraft is currently available. Available crosswind component data can be found in applicable dash 10s.

If you have a question
about personal equipment or rescue/survival gear,
USAAAVS, Fort Rucker, AL 36360
write Pearl,

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

More on Water Survival Training

Water survival training in the Navy is now oriented to approximately 24 hours or less in the water before pickup. The thrust of the training is on proper use of equipment to include egress from submerged aircraft, disentanglement from parachute harness, use of communications equipment and operation of life raft.

U. S. Navy water survival training can be obtained from various naval units including:

- Air Atlantic.
- Air Pacific.
- Naval Aviation School Command.
- Bureau of Medicine & Surgery.
- Marine Air Corps Station, Hawaii.

The survival courses offered by these activities are a combination of sea and land survival and usually only one day is devoted to the sea survival situation. Quotas to attend Navy schools should be requested through channels to Department of the Navy.

The U. S. Army Formal Schools Catalogue, DA Pam 350-10, lists a 5½-day sea survival course, number 2C-F4. With the exception of the apparent lack of availability of a Dilbert Dunker noted in the course outline, this course seems to be suited to Army operations. Detailed information about this course was provided in the February issue, page 47.

Long-Johns

According to the January 1973 ARMY AVIATION DIGEST, *men's ankle-length drawers, 50 percent cotton and 50 percent wool knit (FSN 8415-904-5119 through -5124), have been designated for air crewmember use and are available through normal supply channels.*

I have tried to purchase these "Long-Johns" at a post clothing sales store and have been told they are not authorized for the National Guard. Guard pilots get just as cold as regular Army pilots. What can you do for us?

Common Table of Allowances No. 50-903 indicates that the Nomex underwear is authorized for issue to the National Guard.

The National Guard Bureau in Washington, DC, was contacted and the authorization of the underwear for the National Guard was discussed with personnel in the Aviation Office, who stated that there should be no difficulty in obtaining the underwear. However, a copy of your request for assistance was forwarded to the Bureau for further investigation into the problem.

If additional information is required, please contact your Bureau.

Flight Jackets

We would like some information on where we could order a few flight jackets.

Flight jackets may be requested through your unit supply activity. The authority to use in requisitioning flight jackets is the Common Table of Allowances No. 50-901. These jackets are issued on the following basis: one each per Army aviator, aerial observer, student pilot undergoing flight training or individual on flight status. If you do not come under one of these categories, you are not authorized a flight jacket and may not requisition one.

Are They or Aren't They?

It has been brought to the attention of the U. S. Army Agency for Aviation Safety that the impact-resistant aviator sunglasses cannot be identified from the nonimpact-resistant type by visual comparison. The frame and the lens coloring are identical and each type has the same Federal stock number—8465-753-6261. However, there is a way to identify the type of sunglasses. Stamped on the flap of the *case* are the words IMPACT RESISTANT and the contract numbers that signify fiscal year 1972 (i.e., DSA-120-72, etc.). To comply with federal regulations, all aviator sunglasses from the beginning of FY 72 are impact resistant. But do not let this term lead you to think the glasses are shatterproof—they aren't. Presently, no official exchange policies have been determined for turning in the old glasses for the new ones.

Maintenance and Inspection of Pneumatic Life Rafts and Life Preservers

Inquiries have been received requesting where to locate information on inspecting, repacking and testing pneumatic life rafts and life preservers. General guidelines are contained in TM 55-1500-204-25/1, dated April 1970, with change 4, chapter 1, section VI, "Maintenance of Survival Equipment." However, more detailed information can be found in TM 55-8465-206-23, "Organizational and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Army Aircraft Survival Kits," dated 26 September 1972.

Milan Buchan
Directorate for Aircraft Accident Analysis and Investigation

Arnold R. Lambert
Directorate for Education and Prevention
USAAAVS

ROLLOVER! TILT! UPSET!

AND THAT'S HOW I got my Broken Wing Award. How did you get yours?

Well, I was flying an OH-58 Kiowa and I'd been feeling this high frequency vibration for about an hour. It didn't seem too severe to me and nobody ever told me to terminate a flight when I felt a minor high frequency vibration, so I continued my mission. All of a sudden there was a loud explosion and the aircraft went into a 90-degree left bank. I entered autorotation and found that I had antitorque failure and was in a descending, uncontrolled left turn. During deceleration the aircraft started a spin to the right. I applied collective to slow the spin and when I pulled final pitch the aircraft touched down with no forward air speed. There was fire in the engine compartment but my copilot and I got out without a scratch or a burn. I found out later that the first stage gas producer wheel disintegrated in flight and the tail rotor was severed by flying projectiles.

How many of you have listened to a fellow aviator give a detailed description of a near-accident experience? His account of what happened usually contains a phrase like, "I thought my number was up" or "I thought I'd had it." These stories always end with a Broken Wing Award type maneuver that saved the day. They make interesting conversation and lessons can be learned from them.

How many aviators, including yourself, have been in near-accident situations but can't tell about them? Can't tell about them because they didn't realize how close they were to having an accident. If the number could somehow be computed, it would probably astonish everyone.

Here's an example of a near-accident situation you may have been in and didn't know it if you have ever flown a single rotor helicopter and you're not familiar with its rollover characteristics.

Rollover Characteristics

During normal or slope takeoffs and landings with some bank angle or side drift and with one skid on the ground, the bank angle or side drift can cause the helicopter to get into the situation where it is pivoting about a skid (or wheel). When this happens, lateral cyclic control response is more sluggish and less effective than for the free hovering helicopter. Consequently, if the bank angle (the angle be-

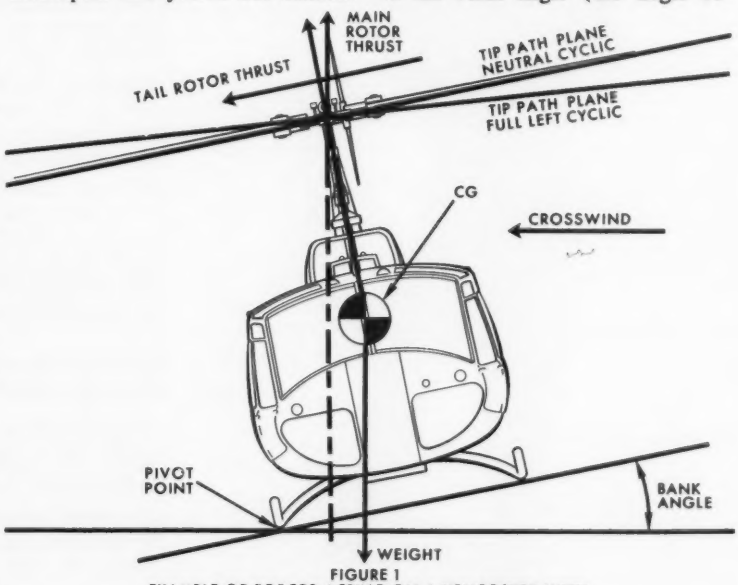


FIGURE 1
EXAMPLE OF FORCES ACTING ON A HELICOPTER WITH RIGHT SKID ON THE GROUND

During normal takeoffs to a hover and landings from a hover, cross slope takeoffs and landings, and takeoffs from the ground with bank angle or side drift, a situation can exist where the helicopter will pivot about the skid/wheel which remains on the ground and enter a rolling motion that cannot be corrected with full lateral cyclic input

tween the aircraft and the horizon) is allowed to build up past 15 degrees, the helicopter will enter a rolling maneuver that cannot be corrected with full cyclic and will roll over on its side. In addition, as the roll rate and acceleration of the rolling motion increases, the angle at which recovery is still possible is significantly reduced. The critical rollover angle is also reduced for a right-skid-down condition, crosswinds, lateral center of gravity offset and left pedal inputs. For cases where these items are all in their most critical condition, and for high gross weight at high altitude, hot day conditions, hovering on the right skid with thrust (lift) approximately equal to the weight is probably uncontrollable for any bank angle.

Avoidance Procedures

When performing maneuvers with one skid on the ground, care must be taken to *keep the aircraft trimmed,* especially laterally. For example, if a slow takeoff is attempted and the tail rotor thrust contribution to rolling moment is not trimmed out with cyclic, the critical recovery angle will be exceeded in less than 2 seconds.

Control can be maintained if the pilot maintains trim, does not allow aircraft rates to become large, and keeps the bank angle from getting too large. The pilot must fly the aircraft into the air smoothly, keeping excursions in pitch, roll and yaw low, and not allowing any untrimmed moments.

When performing normal takeoffs and landings on relatively level ground with one skid on the ground and thrust (lift) approximately equal to the weight, carefully maintain the aircraft position relative to the ground with the flight controls. Perform maneuvers smoothly and keep the aircraft trimmed so that no aircraft rates build up, especially roll rate. If the bank angle starts to increase to a large angle (5 to 8 degrees) and full corrective cyclic does not reduce the angle, reduce collective to reduce the unstable rolling moment from the thrust (lift) vector.

When performing slope takeoff and landing maneuvers, follow the published procedures, being careful to keep roll rates small. Slowly raise the downslope skid to bring the aircraft level and then lift off. (If landing, land on one skid and slowly lower the downslope skid). If the aircraft rolls to the upslope side (5 to 8 degrees), reduce collective to correct the bank angle and return to wings level and then start the takeoff procedure again.

Collective is much more effective in controlling the rolling motion than lateral cyclic because it reduces main rotor thrust (lift). A smooth, moderate collective reduction of less than approximately 40 percent (at a rate less than approximately full up to full down in 2 seconds) is adequate to stop the rolling motion with about 2 degrees bank angle overshoot from where down collective is applied. Care must be taken to not dump collective at too high a rate as to cause fuselage-rotor blade contact. Additionally, if the helicopter is on a slope and the roll starts to the upslope side, reducing collective too fast creates a high roll rate in the opposite direction. When the downslope skid hits the ground, the dynamics of the motion can cause the helicopter to bounce off the upslope skid and the inertia can cause the aircraft to roll about the downslope skid and over on its side. Do not pull collective suddenly to get airborne as a large and abrupt rolling moment in the opposite direction will result. This moment may be uncontrollable.

Warning

If the aircraft reaches 15 degrees of bank angle with one skid on the ground and thrust (lift) approximately equal to the weight, it will roll over on its side.

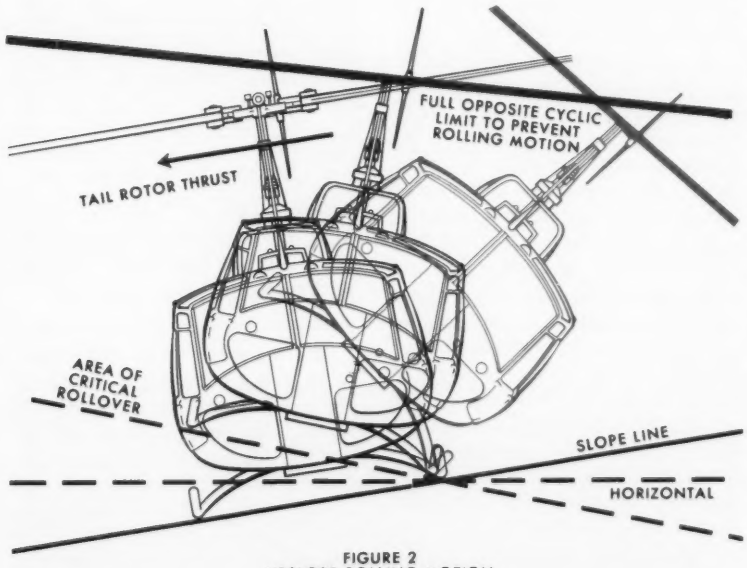


FIGURE 2
UPSLOPE ROLLING MOTION

Excessive application of cyclic into the slope, in coordination with collective pitch application. During landings or takeoffs, this condition results in the downslope skid rising sufficiently to exceed lateral cyclic control limits and an upslope rolling motion occurs

ROLLOVER! TILT! UPSET!

Caution

When landing or taking off, with thrust (lift) approximately equal to the weight and one skid on the ground, keep the aircraft trimmed and do not allow aircraft roll rates to build up. Fly the aircraft smoothly off (or onto) the ground, carefully maintaining trim.

The following information applies to UH-1 series helicopters and is basically the same for all single rotor helicopters; however, the area of critical rollover will vary for other series helicopters depending on vertical and lateral CG, landing gear configuration, tail rotor thrust moment, etc.

UH-1 Slope Landing Techniques

Techniques for slope landings and takeoffs are the same for all series of the UH-1. The following precautions must be considered during slope operations.

1. Less lateral cyclic control will be available during crosswind operations with the wind coming from the upslope side.

2. Slope operations should be avoided with tailwind conditions.

3. Less lateral cyclic will be available for left skid into slope operations due to the translating tendency of the tail rotor.

4. If passengers or additional crewmembers are picked up or off-loaded after landing, the lateral cyclic requirement will change and must be reevaluated prior to pickup.

5. The interconnecting fuel line between tanks can cause unbalanced loading laterally due to fuel slosh or gravitational flow of fuel to the downslope tank. This shift of CG varies depending on fuel load, slope gradient and length of time the aircraft has been laterally inclined.

A slope of 5 degrees to 8 degrees can be accommodated safely without encountering mast bumping or reaching lateral cyclic limits. During slope landing, consideration must be given to the combined effects of slope gradient, wind, load position and soil stability.

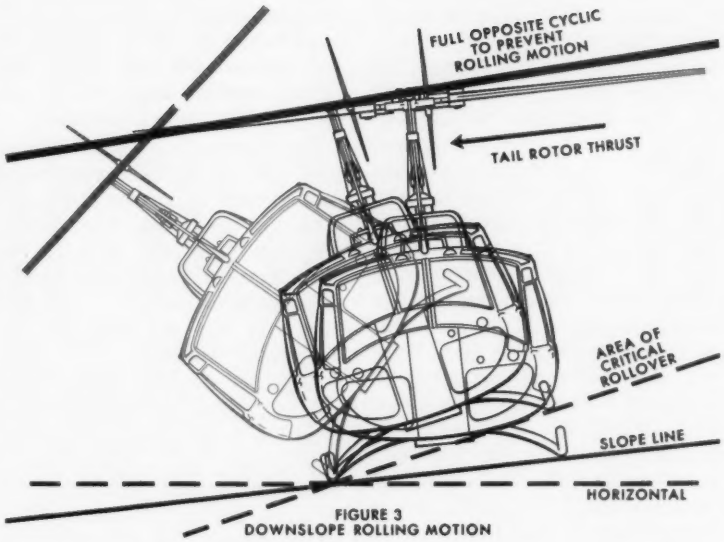


FIGURE 3
DOWNSLOPE ROLLING MOTION

Excessive application of collective pitch in coordination with cyclic application into the slope. When the downslope skid is on the slope, excessive application of collective may result in the upslope skid rising sufficiently to exceed lateral cyclic limits and induce a downslope rolling motion

If cyclic limits are reached during slope operations, further lowering of the collective may induce mast bumping. Therefore, if the cyclic control contacts the stop, before the downslope skid is resting firmly on the ground, return to a hover and select a position with a lesser degree of slope.

If, during takeoff from a slope, the upslope skid starts to leave the ground before the downslope skid, smoothly lower the collective and check to see if the downslope skid is "stuck" or "caught" on some object. Make the helicopter do what you want it to do before it becomes uncontrollable. Accept nothing less than a vertical ascent.

The dangers of dynamic rollover are not restricted to slope operations. Several rollover accidents have occurred on level surfaces. The fact that a skid gets caught on PSP or stuck in soft asphalt doesn't necessarily mean that aircraft rollover is inevitable. The end result depends on the man at the controls and how quickly and accurately he analyzes the problem and initiates corrective action. Improper control application can intensify the rolling motion and place the aircraft in an unrecoverable attitude.

Shown here are just two of the many accidents that have occurred where aircraft have rolled over on level surfaces.

Accident No. 1

The parking ramp was resurfaced with a 3-inch layer of asphalt and was released by the contractor for use. The rear skids of UH-1D and UH-1B aircraft landing on this new surface caused numerous depressions and humps in the landing areas which prevented lateral shifting movement of aircraft in ground contact.

The pilot of a UH-1B applied collective pitch to pick the aircraft up to a hover. He had the cyclic

Accident Number 1

to the rear and off center to the right, causing the rotor plane to be tilted off perpendicular to the ground to the right. As collective was applied, the lifting moment, acting perpendicular to the rotor plane, caused the left skid to leave the pavement and the aircraft began a slow roll to the right. The right skid was in a depression in the asphalt approximately 1½ inches deep. The right skid was not stuck but the depression was sufficient to deny the center of gravity of the aircraft to shift to the right and center under the lifting moment.

The pilot was in the right seat and failed to recognize the severity of the angle. He had no reason to feel that the aircraft would not shift to the right and center, so he continued to slowly increase collective. This action increased the roll and shifted the center of gravity (CG) to the outside of the right skid.

At this point the aircraft commander recognized that the aircraft was approaching its lateral CG limits and ordered the pilot to put it back down. The only option left to the pilot at this time was to apply additional collective and lift the aircraft over the asphalt hump and allow the aircraft to center under the rotor plane. The pilot stopped the increase in collective and applied full left cyclic and down collective. This action tilted the rotor plane to the left but the lateral limits were insufficient to level the rotor plane and shift the lifting moment to the left of perpendicular, stop the roll and return the CG to the inside of the right skid.

Accident Number 2

When the pilot downed the collective, he destroyed the supportive lifting moment and any chance of saving the aircraft. At this point, the aircraft commander got on the controls with the pilot. The aircraft continued to roll to the right until the main rotor hit the pavement. After three blade strikes, the aircraft came to rest on its right side.

The accident investigation board listed crew error as the cause of this accident. The pilot interpreted a maneuver that exceeded the lateral limits of the aircraft as a control malfunction and took inappropriate corrective action. The aircraft commander did not take immediate corrective action after recognizing that the aircraft was in a dangerous attitude.

Accident No. 2

An AH-1G pilot started to bring his aircraft to a hover. According to the pilot, "As I increased collective, getting the aircraft light on the skids, it started moving to the right. I put in left cyclic with no immediate effect. I then put in full left cyclic, and realizing this had no effect, I lowered collective. The main rotor blade then made contact with the ground, throwing dirt and dust all over." After the main rotor struck the ground, the aircraft rolled approximately 135 degrees around the longitudinal axis and came to rest on its right side. No cause factor was conclusively established for this accident.

Be aware of this near-accident situation and don't allow your aircraft to ROLLOVER, TILT or UPSET.

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Round Robin Or Stopover: Recent queries to the USAASO indicate some problems or misunderstandings relative to IFR flight plan submissions and how they are supposed to work. Basically an IFR plan can be local, point to point, stopover or round robin. Local IFR, as when one shoots multiple approaches in his own area, and simple point to point IFR flights seem to present few problems to pilots or controllers.

The IFR "stopover" plan is little more than a series of point to point plans that may or may not terminate at the point of origin. Most problems with stopover flight plans are pilot induced either through the mechanics of the DD Form 175 or not following the communications procedures required to make the system work once we are off and running. The follow-on comm procedures are well outlined in FLIP Planning. See the note following paragraph IB16.

A round robin flight plan is one which returns to the point of origin *without stopping enroute.* This should present no problem except when a delay for practice approaches is planned. According to our Federal Aviation Administration (FAA) friends, this can be accomplished in all ARTCCs except one—Jacksonville (and that one also when its new computers are installed). The key to a successful "round robin" plan seems to rest with the dispatcher as much as anyone. Regardless of the number of delay points, the pilot must fill in a total ETE on the 175 without including the time proposed for practice approaches. He then notes the delay points and the time for each in the remarks section of the 175. The dispatcher must then pick the proposed delay point and time out of remarks and transmit it properly to the ARTCC as outlined in AR 95-11 or the Flight Services Manual (7110.10B). The center computer will then print the strip for the entire flight with the delay programed in. If a two-way radio failure occurs enroute or after a delay has been authorized, the pilot must be cognizant of the special military procedures stated in paragraph 7 of emergency procedures at the back of the IFR Supplement Enroute US.

In summary, remember that IFR flight plans put a lot of folks in the same bed and communicating with each other is the key to success. If you throw a complex 175 on the counter on the way to your bird without discussing it with the ops man, don't be too surprised if you don't get all you asked for from the system. By the same token, if your well planned flight plan doesn't work, find out where the system failed and take action through your command or through personal coordination with the local FAA office to make it work.

Takeoff Restrictions? When is an SID not an SID? When it's a "T." No, folks, that "T" in a blue triangle in the remarks section of some approach plates doesn't mean bring your clubs anymore than the "A" in the triangle means a good RON spot. In an informal survey of aviators across a broad spectrum of experience, the answer was to disregard the "T" as not applying to AA's. Only a few knew that the "T" means there are obstructions or required flight track restrictions in the departure area. Fewer realized that higher takeoff minimums are applied (mandatory for civil users) so that the obstructions may be seen and avoided during the IFR departure. Very few of the aviators interviewed knew that obstruction avoidance procedures are seldom included in IFR clearances from controlled civil airports and almost never from uncontrolled airports. The question is: Are we using an excellent safety tool or are we passing over the "T" when presented because our regulations allow departure from 0/0 to 200/½, depending on qualifications?

What's the solution? Behind the index in the civil SID books you receive every 56 days with your other IFR FLIP is a tabular listing of all aerodromes that are marked with a "T" in the approach books. Although we can legally disregard the numbers applying to takeoff minimums, the verbiage on initial departure routings should be considered in takeoff planning. If no specific information is shown and you exercise your lower minimums for takeoff, it might be wise to check with the local folks on what's out there in the smog that caused that "T" to be placed on the plate.

In the near future takeoff data referred to in the U. S. civil SID publication will me removed and placed in the appropriate approach books near the nonstandard alternate minima tabulations as is now the case in certain oversea areas. When this happens the data will be updated every 28 days, right along with the approach, enroute and other information which ties the system together. Good flight planning includes a review of the *approach plate* for the *departure field!*

☆ U.S. Government Printing Office 1973—746-161/5

CW3 Michael S. Lopez

On 23 May 1966 LTG Jean E. Engler, deputy commanding general, USARV, presented 1st Aviation Brigade colors to then Brigadier General George P. Seneff Jr., first commander of the "Golden Hawks"

"Hawk" Colors Flying At Fort Rucker

FOR THE PAST 7 years Army aviation's "Golden Hawks" of the 1st Aviation Brigade have provided support to free world forces in tactical operations from the Republic of Vietnam's Mekong Delta region to the Demilitarized Zone in Cambodia and in Laos.

As the last troops departed Vietnam on 29 March 1973, the brigade's colors were brought to Ft. Rucker, AL.

Although the brigade is but 7 years old, its origins date back to December 1961 when the 8th and 57th Transportation Companies arrived in Vietnam with their CH-21 Shawnee helicopters. They were later redesignated the 117th and 120th Assault Helicopter Companies and were incorporated into the brigade at its formation and were the oldest active Golden Hawk units.

Organized in Vietnam on 11 March 1966 as the U. S. Army Aviation Brigade (Provisional), the 1st Aviation Brigade joined the Army's force structure on 25 May 1966. The original organization numbered only 11,000 officers and men; however, it reached its maximum strength of more than 23,000 in the summer of 1970, making it larger than most Army divisions.

Men of the "Golden Hawks" flew their aircraft in the skies over Southeast Asia 24 hours a day . . . providing troop lift, gunship support, fixed wing transportation, artillery adjustment, surveillance and reconnaissance as well as liaison support for ground forces. With the exception of MACV advisors and Special Forces teams, the bulk of the U. S. Army's efforts in Vietnam from 1962 until 1964 was centered on Army aviation.

Southeast Asia became a testing ground for the helicopter and Army aviation. The faces of the pilots and crews were many, even their equipment changed as new aircraft entered the Army inventory, but their mission remained much the same . . . hauling everything from pay for the troops to food and ammunition, as well as the troops themselves . . . providing airmobility for the ground commander—freeing him from natural obstructions and allowing him the greater benefit of surprise . . . .

On 6 April 1973 MG Allen M. Burdett Jr., commanding general of Ft. Rucker, AL, and former commander of the "Golden Hawks," received the 1st Aviation Brigade colors from LTC James T. McQueen, commander of the colors detachment. CSM Francis Aquinaldo (center) and 1SG Allen Brewer, the top enlisted men of the brigade headquarters, accompanied colors to Ft. Rucker. CSM Clifton Wagner (left center) of Ft. Rucker awaits reception of the colors

BROKEN WING AWARD RECIPIENTS

THE UNITED STATES Army Agency for Aviation Safety (USAAAVS) is proud to report that of the 111 Broken Wing Aviation Safety Award nominations reviewed during CY 1972, 79 (71 percent) were approved. Following are the names of those aviators who received the award for their display of extraordinary skill, judgment and professional technique during inflight emergencies.

CW2 Edward W. Allphin
CW3 James R. Anderson
1LT James A. Ayers
CPT Elias B. Baker
WO1 David L. Barber
MAJ Michael L. Beavers
CW2 Hjalmer R. Blad
WO1 Howard E. Bloyer
CPT Patrick J. Bodelson
2LT Ralph M. Buie
*MAJ James H. Burns
CPT Billy H. Causey
WO1 Walter W. Champion
CW2 McDade Cocherell
CW2 Roy C. Daw
CW3 Henry G. Dickson
CW2 Jerome J. Eltgroth
CPT Frederick C. Fleming
CPT Charles W. Fritz
1LT James F. Galloway
CPT William M. Gold
CW2 Thomas J. Habitzruether
CPT Marion D. Hadder
1LT Ronald E. Hale
WO1 Richard G. Hanscom
WO1 Dwain D. Hartwick
CW2 Timothy L. Hendrich
*2LT Cecil B. Hengeveld
MAJ Leslie J. Hepler
CW2 David A. Herbert
CW2 Allen J. Hodder
CPT Roger E. Holford
CPT Thomas A. Johnson
CW2 Steven P. Kelley
MAJ Joseph C. Kennedy
LTC Joseph R. Koehler
CW2 John W. Korsbeck
WO1 Robert R. Kurabieski
WO1 Clifford W. Lemen
WO1 Wayne M. Loesch
CW2 Rocklin D. Lyons
1LT Stanley M. Lyons
CW2 Thomas A. McBeath
*CPT William McCormick
*MAJ Jesse L. McCrady
CPT William Meeks
WO1 Dan S. Miller
CW3 Wesley D. Page
1LT Richard G. Pluim
CW2 Jesse J. Porter
*CW3 Kenneth R. Pruitt
WO1 Joseph F. Pryor
CW2 Marvin L. Reynolds
CPT Michael L. Rosebeary
CPT Alan M. Russo
CW2 Thomas E. Scarborough
*MAJ John W. Spalding
CPT Peter H. Smyth
WO1 Hartwell P. Strickland III
CPT Jack C. Tapp
WO1 Robert E. Taylor
*CW2 Harold E. Tiffany III
CPT Basil D. Tisdale
CW2 Russell D. Toms
CW2 Steven L. Utley
CW2 Melvin G. Wade, Jr.
*CW2 William J. Wagner
CW2 Kenneth C. Wallace
*CPT Thomas G. Wardell
CW2 Richard E. Warren
CW2 Richard W. Watson
CW3 Charles L. Williams
*CPT Richard J. Williams
WO1 John C. Willis
CW2 John M. Wilson
CW2 Gary L. Woodrum
CPT Paul N. Yacovitch
LTC Robert L. Young
CW2 Theodore M. Zogg

*Denotes National Guard aviators